2.4

TECHNICAL MEMORANDUM

Company Lake Supplemental Data Summary

Technical Memorandum DS No. 15

Prepared for

Reynolds Metals Company

Troutdale Facility

MARCH 26, 1996

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Prepared by

CH2M HILL

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Company Lake Supplemental Data Summary

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1 Introduction

This technical memorandum summarizes information collected from August through November 1996 during implementation of the *Company Lake Supplemental Data-Gathering Work Plan* (CH2M HILL, August 14, 1996) for the Reynolds Metals Company (RMC) facility in Troutdale, Oregon. The following information is presented in this data summary:

- Bathymetry of Company Lake
- Topography of the area surrounding Company Lake
- Aquatic plant species and distributions
- Logs of cores and borings from Company Lake and West Company Lake
- Physical and chemical analyses of Company Lake sediment
- Chemical analysis of soil from within the brick on the south shore of Company Lake
- Chemical analysis of West Company Lake soil
- Chemical analysis of soil collected in the depression east of the outfall ditch
- Dike construction historical review
- Potential flood impact evaluation

This data summary will be used to update the conceptual model for Company Lake as presented in the *Draft Current Situation Summary* (CSS) (CH2M HILL, April 5, 1996). The updated conceptual model will provide a basis for development of the *Wastewater Discharge Areas Addendum to the RI/FS Work Plan* (CH2M HILL, March 26, 1997). This addendum is scheduled for completion in spring 1997.

An evaluation of groundwater was not included in this field effort, nor is it provided in this report. Sitewide groundwater conditions are being addressed as part of the RMC groundwater program. Additionally, the groundwater conceptual model for Company Lake will be reviewed and the data needs are addressed in the *Wastewater Discharge Areas Addendum to the RI/FS Work Plan* (CH2M HILL, March 26, 1997).

2 Site Background and Setting

The Company Lake area includes Company Lake, West Company Lake, and a depression east of the outfall ditch (see Figure 2-1). Descriptions of the area and the area history are provided below.

2.1 Area Description

Company Lake is a wastewater treatment pond located north of the U.S. Army Corps of Engineers (COE) dike and is oriented east to west. The surface area of the lake is approximately 600,000 square feet [14 acres at a normal surface water elevation of about 15.5 feet National Geodetic Vertical Datum (NGVD)], not including the outfall ditch. The COE dike forms the south bank of Company Lake; the north face of the COE dike has been partially lined with refractory brick. The pond is bordered on the north by native and non-native vegetation, including stands of hardwoods and Himalayan blackberries. The outfall road forms the eastern boundary of the pond. Gresham Sand and Gravel (GS&G) property forms the western boundary of the pond.

RMC wastewater and stormwater from the South Ditch enter the pond through a pipe at the southwest end. The pipe is oriented to discharge toward the east.

An outfall ditch connects the northwest end of the treatment pond with the Columbia River. Discharge flows north via the ditch through a Parshall flume to an overflow pipe and into the river. This discharge is monitored in accordance with RMC's National Pollutant Discharge Elimination System (NPDES) discharge permit. RMC personnel routinely measure the flow rate and collect water samples at the flume. During periods of high water in the Columbia River, water flows from the river into Company Lake via the outfall ditch.

West Company Lake was once part of Company Lake but was filled and is now owned by GS&G. Dredged materials from the river are stockpiled over West Company Lake as part of the GS&G operations. Borings through West Company Lake indicate that the existing fill material is 8 to 24 feet deep.

A depression on the eastern side of the outfall ditch, about midway between Company Lake and the Columbia River, has been observed to collect surface water when river levels are high. The depression appears to be part of a former small channel that extended to the Sandy River. The depression is now isolated from surface runoff to the east by a road and to the west by the outfall ditch berm, and is approximately 700 feet long by 80 feet wide. The berm separating the outfall ditch from the depression is at an elevation of approximately 18 feet NGVD. Wastewater may enter the depression area when the Columbia River floods into the outfall ditch and causes the water elevation to rise above the level of the berm. During extreme high-water events, water may also enter the depression area from the east via the former channel. Surface water is also likely to collect in the depression as the result of stormwater runoff.

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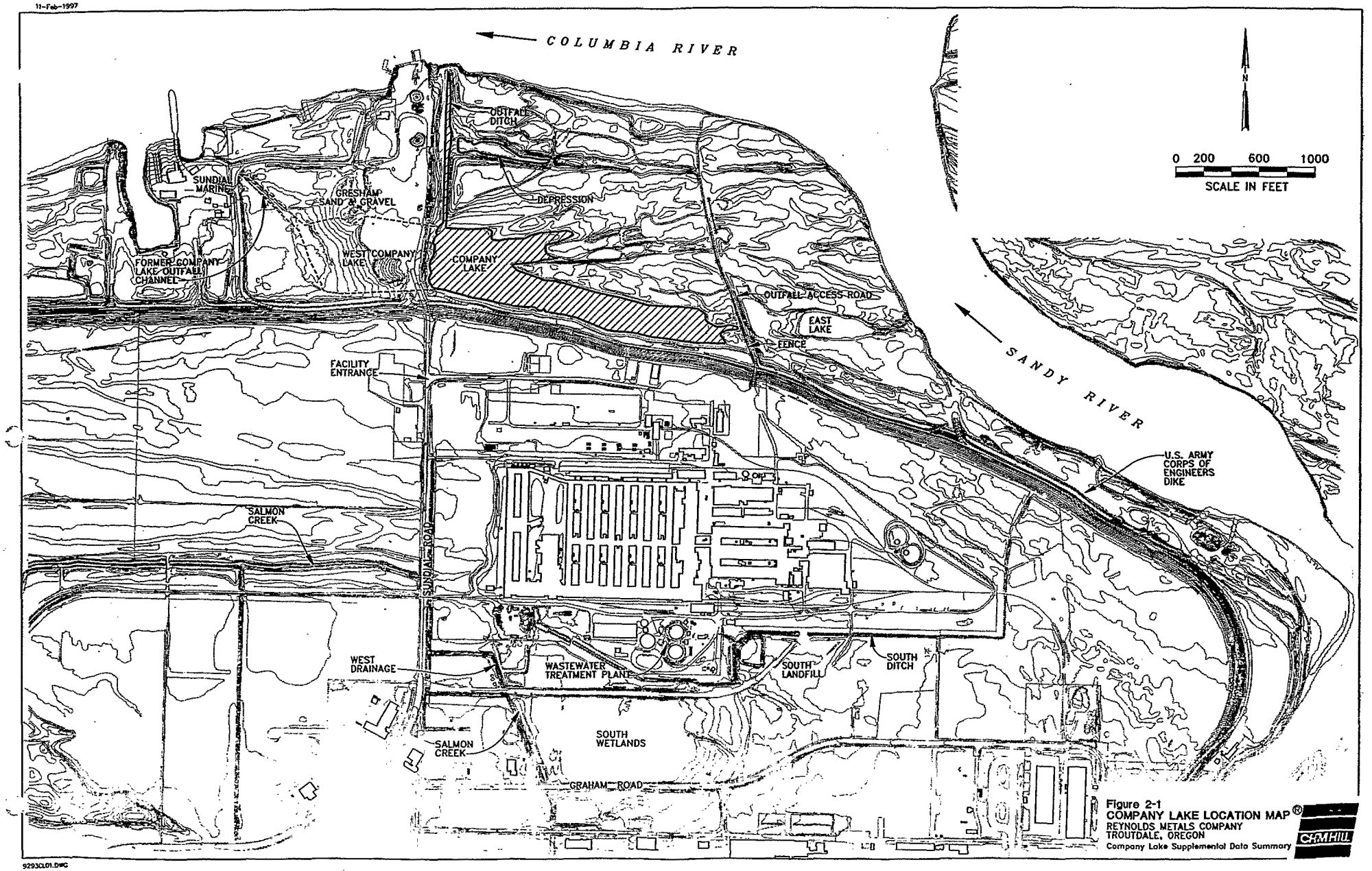

Figure 2-1
COMPANY LAKE LOCATION MAP
REYNOLDS METALS COMPANY
TROUTDALE, OREGON
Company Lake Supplemental Data Summary

CH2MHILL

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2.2 Site History

A history of Company Lake has been developed from aerial photographs and anecdotal information provided by plant personnel. The following is a chronological history:

- 1940: Aerial photographs indicate that in 1940, just before the plant was built, Company Lake and what is now called East Lake (a small depression east of the access road) were connected in series as part of a natural high-water bypass channel between the Sandy and Columbia Rivers.
- 1941: Plant construction was completed. At this time the plant was owned by the U.S. Government.
- 1946: RMC began leasing the plant from the government.
- 1947: RMC began discharging overflow wastewater and stormwater effluent into Company Lake. At that time, the stormwater and wastewater were discharged into the south wetlands and the overflow was diverted into Company Lake. It is believed that the discharge entered Company Lake through a pipe at the south shore in the central area of the pond. This flow continued until 1965.
- 1949: RMC purchased the facility.
- 1957: The outfall access road was improved and thus the connection between Company Lake and East Lake was severed.
- 1965: The discharge from Company Lake to the Columbia River was permitted under the NPDES system. At that time stormwater and wastewater were diverted to the South Ditch (instead of the south wetlands), and then into Company Lake.
- 1969: Because Potline 5 was constructed at the plant, the outfall pipe had to be moved from the central south shore to the southwest corner of the pond (its present location).
- 1970: The present outfall ditch was excavated from the northwest corner of Company Lake to the Columbia River. Before use of this ditch, overflow of the pond occurred through an outfall channel near Sundial Marine (Figure 2-1). The aerial photographic record suggests that after construction of the new outfall ditch, the lake receded, and by 1975, it acquired a shape and extent nearly identical to its current shape and extent.
- 1970 to 1990: The invert elevation of the outfall ditch was raised from about 11 feet in 1970 to the current elevation of about 15 feet. RMC raised the invert elevation to allow installation of flow measurement devices and to reduce the frequency of Columbia River inflow into the treatment pond.
- 1970 to 1975: GS&G filled approximately 1,000 feet of the western end of the pond with dredged sand and gravel from the mouth of the Sandy River. GS&G continues to dredge materials from the river and stockpile them over what is now called West Company Lake. The size of the stockpile varies, but it currently covers about 11 acres of the original surface water area.
- 1991: Major plant operations were stopped for economic reasons. The plant began limited operations, which are ongoing.

The constituents accumulated in the Company Lake sediment are primarily a result of the discharge of facility wastewater and stormwater and are consistent with the use of this area as part of the permitted treatment system. RMC believes that the majority of the process residue in the sediment resulted from bleed streams from the carbon plant (bakehouse) air emission control system discharged to the pond between 1975 and 1989.

3 Field Investigation Program

A field investigation program, consisting of bathymetric and topographical mapping and collection of soil and sediment samples from Company Lake, West Company Lake, and the depression, was performed from August through November 1996. This section details methodologies used in this field effort. Results of the field investigation program and results of the laboratory analyses are presented in Section 4, Results.

3.1 Initial Bathymetric Survey and Sediment Probing

An initial investigation of pond bottom depth and sediment composition was performed on August 20 and 21, 1996, by CH2M HILL personnel. Originally, it was thought that the process residue layer consisted of very loose, unconsolidated materials overlying a more consolidated layer in the pond bottom. The initial investigation was performed to identify and quantify the unconsolidated process residue layer thickness and the total process residue layer thickness, and to obtain preliminary bathymetric pond bottom data.

A series of measurements was performed at 63 locations on the pond. At each of the locations, the following measurements were taken:

- A sludge blanket indicator (a photoelectric cell with an attached light source) was lowered until the instrument measured a sharp decrease in light transmission, an indication of a solid layer. This depth was recorded, and an elevation was calculated on the basis of the surface water elevation. This elevation was considered to be the top of the unconsolidated process residue layer.
- A 6-inch-square steel bottom plate was attached to a pole that had a survey prism on its top. The plate was lowered to the bottom until it encountered resistance, and the location and elevation were surveyed with a theodolite and electronic distance meter (EDM). This elevation was considered to be the top of the consolidated process residue layer (bottom of the unconsolidated layer).
- A length of ½-inch steel rebar was lowered to the top of the process residue layer. The rebar was marked at the water level with surveyor's flagging. The rebar was then pushed into the bottom by hand until refusal. The rebar was again marked with surveyor's flagging at the water level. The rebar was pulled out and the distance between the two measured levels was recorded; this distance was used to approximate the thickness of the process residue layer.

The initial probing revealed the following:

- An unconsolidated process residue layer did not appear to be present; the depths measured by the sludge indicator blanket and the steel plate were nearly identical (within measurement error). Subsequent visual observations during core collection

confirmed that there was no unconsolidated layer and that the process residue layer had a similar vertical consistency.

- The total process residue layer thickness ranged from nonexistent to more than 4 feet.
- The water depth varied from about 3 feet to more than 15 feet deep, with the greatest depth recorded at the east end of the lake.

These data were used to identify and refine methodologies for final bathymetric surveying and sediment coring.

3.2 Final Bathymetric Survey and Topographic Mapping

A final bathymetric survey of the treatment pond was performed by CH2M HILL surveyors from August 27 through 30, 1996. Measurements were made with a 6-inch by 6-inch steel plate mounted on the bottom of a survey rod, with a prism mounted on top for the EDM. Locations and elevations were surveyed to determine the bathymetric profile of the pond bottom.

Topographic mapping around the shoreline of the pond was performed from August 27 through 30, 1996, by CH2M HILL surveyors using a total station theodolite and EDM. Measurements were made approximately 100 feet beyond the banks of the pond.

3.3 Vegetation Survey

An aquatic plant survey of Company Lake was conducted in conjunction with efforts to map depths of water and unconsolidated sediments, on August 20 and 21, 1996. Plants were identified at 63 locations along north-south transects of the pond. Plants were collected for identification either manually (in shallow water) or with a dredge or hook (in deeper water).

3.4 Methods of Collecting Soil and Sediment Samples

Soil and sediment samples were collected within and in the immediate vicinity of Company Lake from October 15 to October 21, 1996, and from West Company Lake on November 26 and 27, 1996. The sample locations are shown in Figure 3-1.

All sampling activities were conducted in accordance with the *Draft Sampling and Analysis Plan* (SAP) and the *Draft Activity-Specific Safety and Health Plan*, both prepared by CH2M HILL and submitted to the U.S. Environmental Protection Agency (EPA) on May 8, 1996. Information on the field survey of sample locations, the sample collection methodology, equipment decontamination, sample locations and analyses, and field quality assurance and quality control (QA/QC) samples is presented in the paragraphs that follow.

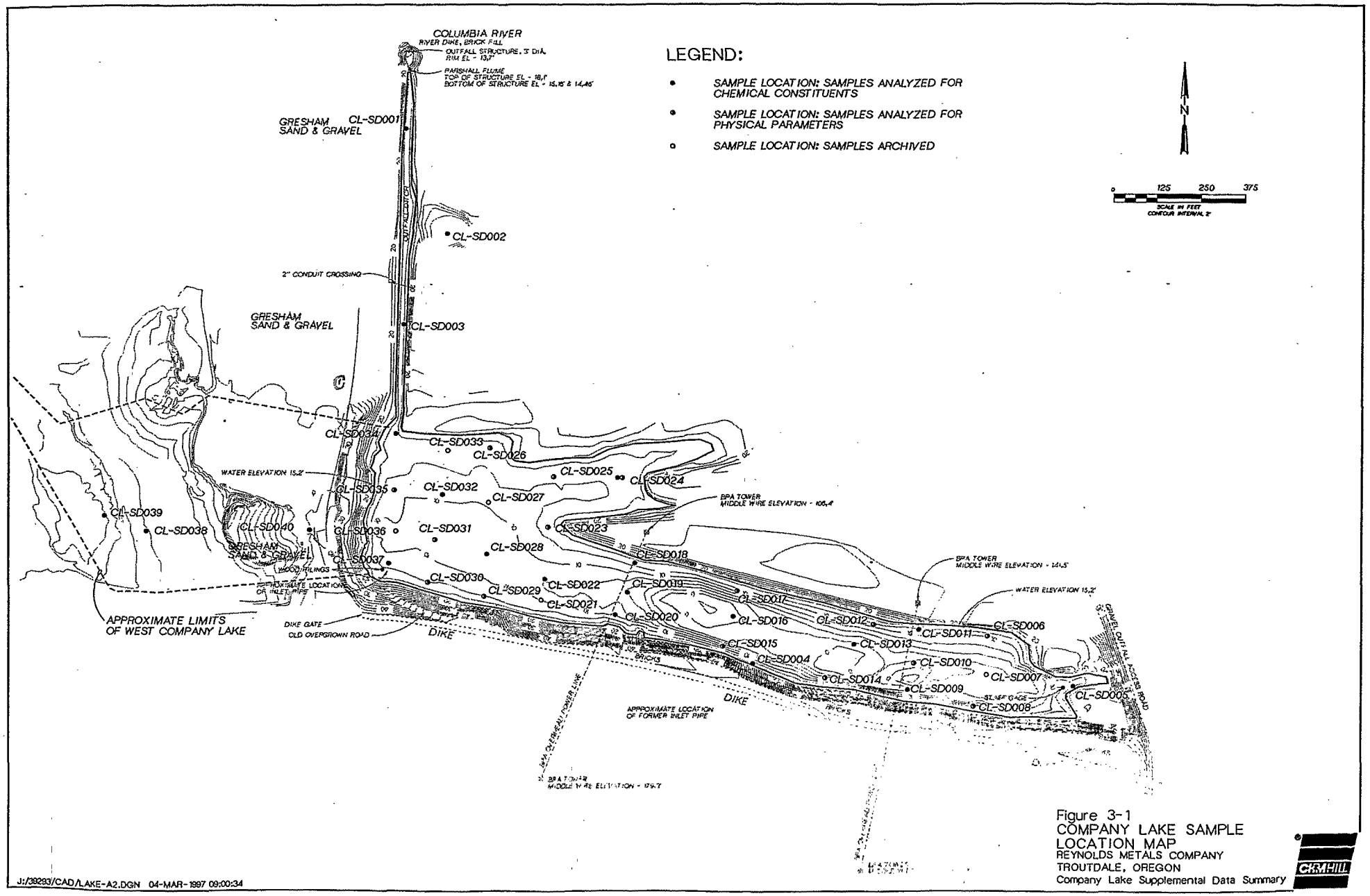

Figure 3-1
COMPANY LAKE SAMPLE LOCATION MAP
REYNOLDS METALS COMPANY
TROUTDALE, OREGON
Company Lake Supplemental Data Summary

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3.4.1 Field Survey of Sample Locations

Company Lake sample locations were chosen after north-south transects were run at a spacing of approximately 150 feet, with one to four sample locations along each transect.

Field locations for all pond samples were established by temporary anchoring of buoys labeled with the station number. Field locations in the outlet and shore samples were established with a labeled wooden lath. After sampling was completed, all sample locations were surveyed by CH2M HILL surveyors using a total station theodolite and EDM. The depth to the pond bottom at each sample location was also determined at the time of surveying by the method described in Section 3.2, Final Bathymetric Survey and Topographic Mapping.

3.4.2 Sample Collection Methodology

Sediment samples were collected in Company Lake and the outfall ditch by a variety of methods, including an AMS soft sediment sampler and a barge-mounted sediment core sampler. The soil sample from within the brick was collected with a shovel. Subsurface soil samples in West Company Lake were collected by conventional drilling and use of a split-spoon sampler. Sampling equipment was decontaminated in accordance with methods described in Section 3.4.3, Decontamination of Sampling Equipment. Each sample collection method is described below in greater detail.

Shovel. One soil sample was collected with a standard shovel at Station CL-SD004 on the south shore of the pond, within the brick. The shovel was used to advance a hole to a depth of 1 foot and to obtain a soil sample. The sample was placed in a stainless steel bowl, mixed with a spoon to provide a homogeneous sample, and then transferred to clean sample containers for laboratory analysis. The samples collected for volatile organic compound (VOC) analyses were not mixed, but rather were placed directly into the VOC sample jar.

AMS Soft-Sediment Sampler. Surface sediment samples were collected at Stations CL-SD001 and CL-SD003 in the Company Lake outfall ditch, and one surface soil sample was collected at Station CL-SD002 in a depression east of the outfall ditch, by means of a two-piece AMS stainless steel, soft-sediment sampler. The square, shafted sampler was equipped with a one-way stainless steel flap valve, removable side, hammer guide, and hammer. The sampler was pushed into the ground manually until refusal, and then driven further with the hammer. After the sampler was retracted, the removable half of the sampler was displaced to retrieve the sediment. The sample was logged, placed in a stainless steel bowl, mixed with a spoon to provide a homogeneous sample, and then transferred to sterilized sample containers for laboratory analysis. The samples collected for VOC analyses were not mixed, but rather were placed directly into the VOC sample jars.

Barge-Mounted Sediment Core Sampler. Sediment samples from Stations CL-SD005 to CL-SD037 were collected by use of a barge-mounted sediment core sampler. The barge-mounted core sampler was operated by Advanced American Diving Service, Inc., of Oregon City, Oregon, under subcontract to CH2M HILL. The sampler was operated from a 30-foot-long barge equipped with an A-frame structure and electric winch mounted on the bow for core retrieval. The sampler is a 5-foot-long, 2-inch-inside-diameter stainless steel casing with a closing valve inside the head assembly.

At each sample location, the stainless steel sampler was decontaminated and a 5-foot-long, 2-inch-diameter, clear plastic sample tube was placed inside. The sampler tip was placed on the sampler tube to prevent the tube from falling out and yet leave the penetrating end open. The sampler was then lowered to sediment depth by hand via pipe extensions, and driven by hand until refusal. Once refusal was encountered, the sampler was driven with a hydraulic jackhammer at low speeds to prevent disturbance of the sample. The sampler was driven to a maximum depth of 5 feet, then extracted with the winch and placed onto a sampling platform on the barge for onboard processing.

After the core was placed on the platform, the plastic sample tube was extracted and capped. Actual sample recovery was established with a tape measure; the lithology was logged; and the core was photographed. Typically, each core revealed a dark gray or black process residue layer overlying what appeared to be a native sediment layer. Each layer was extruded and placed into separate, decontaminated stainless steel mixing bowls, where they were classified in accordance with the Standard Practice for Description and Identification of Soils [Visual-Manual Procedure, American Society for Testing and Materials (ASTM) D2488] and logged for visual characteristics. Each layer was sampled and prepared for laboratory analysis. One 9-ounce jar was filled with a sample for VOC analyses before homogenization by use of a new stainless steel spoon. The remaining sample was homogenized, and three additional 9-ounce jars were filled for the remaining chemical analyses. When one sediment core did not provide enough sample from both layers to fill all the required sample containers, additional cores were taken adjacent to the original sample location by the same core sample recovery method.

Conventional Drilling. Soil samples from West Company Lake (Sample Locations CL-SD038, CL-SD039, and CL-SD040) were collected on November 26 and 27, 1996, by Geo-Tech Explorations, Inc., under subcontract to CH2M HILL. Samples were collected with 3-inch-inside-diameter stainless steel split spoons driven by standard SPT sampling methods. A drilling rig was used to advance hollow-stem augers to the desired sampling depth, and a decontaminated split spoon was driven 18 inches. The sampler was then withdrawn, split open, logged, placed in a stainless steel bowl, mixed with a spoon to provide a homogeneous sample, and transferred into sterilized sample containers for laboratory analysis. The samples collected for VOC analyses were not mixed, but rather were placed directly into the VOC sample jars.

3.4.3 Decontamination of Sampling Equipment

Decontamination of sampling equipment, including the shovel, petite ponar dredge, AMS soft sediment core sampler, barge-mounted sediment core sampler, plastic sample tubes, core catchers, split-spoon samplers, and mixing bowls, was performed before sample collection and between samplings at different locations to preclude cross-contamination in the samples. Spoons were discarded after each use. Decontamination of the sampling equipment consisted of the following procedure:

- Wash and scrub with tap water and Alconox solution
- Rinse with tap water
- Rinse with 10 percent nitric acid solution
- Rinse with deionized/distilled water
- Rinse with laboratory-grade isopropyl alcohol
- Rinse with deionized/distilled water

The drilling rig, augers, rods, and tools were decontaminated with a steam cleaner before sampling at each location.

All fluids used in decontamination of sampling equipment were collected in 55-gallon drums and disposed of at the RMC facility decontamination pad.

3.4.4 Sample Locations and Analyses

A total of 37 locations (stations) were sampled in the Company Lake area; of those, 18 locations (31 total samples) were chosen for chemical analysis, and 15 locations (17 total samples) were chosen for physical analysis. The remaining samples were archived for potential analysis at a later date. Three locations (five total samples) were sampled in the West Company Lake area, and the samples were analyzed for chemical constituents. The types of sample analysis (chemical, physical, and archival) are indicated in Figure 3-1.

A summary of the samples selected for chemical analysis is presented in Table 3-1, and a summary of the physical (geotechnical) parameters is presented in Table 3-2.

All samples were logged in the field by CH2M HILL personnel. The sediment core logs are presented in Attachment A.

3.4.5 Field Quality Assurance and Quality Control Samples

Three types of QA/QC samples were obtained during field activities: duplicate samples, equipment blanks, and trip blanks. Two duplicate samples were collected from CL-SD028-0000 and CL-SD028-0030. Five equipment blanks and six trip blanks were collected. Duplicate samples and equipment blanks were analyzed for the same constituents as soil and sediment samples. Trip blanks were analyzed for VOCs only.

3.4.6 Data Quality Evaluation

The data were found to conform to analytical and QC specifications for more than 95 percent of the data points. Any deviations have been detailed in reports, and individual data points have been flagged per EPA functional guidelines. These flags are included in the data in this report. The noted minor deviations are not expected to have a significant effect on data usability. The tables in this report also incorporate sample data qualifications for laboratory method blanks per EPA functional guidelines.

3.5 Analytical Methods

Selected soil and sediment samples were analyzed for the chemical constituents and physical parameters described in Subsections 3.5.1 and 3.5.2.

3.5.1 Chemical Analysis

Soil and sediment samples shown in Table 3-1 were submitted for chemical analysis to the CH2M HILL Laboratory in Redding, California (Quality Analytical Laboratories, Inc.), and Oregon Analytical Laboratory in Beaverton, Oregon. The chemical constituents analyzed and methods used are shown in Table 3-2.

Table 3-1
Summary of Soil and Sediment Samples Selected for Chemical Analysis

Study Area	Station Number	Sample Designation	Sampling Method	Sample Depth (feet)	Comments
Company Lake	CL-SD001	CL-SD001-0000-0	AMS Soft Sediment Sampler	0 to 1.2	Outfall ditch, possible process residue
	CL-SD002	CL-SD002-0000-0	AMS Soft Sediment Sampler	0 to 1.5	Soil in depression east of outfall ditch
	CL-SD003	CL-SD003-0000-0	AMS Soft Sediment Sampler	0 to 1	Outfall ditch, process residue
	CL-SD004	CL-SD004-0000-0	Shovel	0 to 1	Brick pile soil
	CL-SD005	CL-SD005-0000-0	Sediment Coring	0 to 0.5	Process residue
	CL-SD005	CL-SD005-0010-0	Sediment Coring	1 to 2	
	CL-SD009	CL-SD009-0000-0	Sediment Coring	0 to 1	Process residue
	CL-SD009	CL-SD009-0020-0	Sediment Coring	2 to 3	
	CL-SD011	CL-SD011-0000-0	Sediment Coring	0 to 1.5	Process residue
	CL-SD011	CL-SD011-0020-0	Sediment Coring	2 to 4	
	CL-SD013	CL-SD013-0000-0	Sediment Coring	0 to 1	Process residue
	CL-SD013	CL-SD013-0025-0	Sediment Coring	2.5 to 3.5	
	CL-SD016	CL-SD016-0010-0	Sediment Coring	1 to 2	
	CL-SD018	CL-SD018-0000-0	Sediment Coring	0 to 1	Process residue
	CL-SD018	CL-SD018-0020-0	Sediment Coring	2 to 3	
	CL-SD019	CL-SD019-0000-0	Sediment Coring	0 to 1	Process residue
	CL-SD019	CL-SD019-0030-0	Sediment Coring	3 to 4	
	CL-SD020	CL-SD020-0000-0	Sediment Coring	0 to 1	Process residue
	CL-SD020	CL-SD020-0025-0	Sediment Coring	2.5 to 3.5	
	CL-SD022	CL-SD022-0000-0	Sediment Coring	0 to 1.5	Process residue
	CL-SD022	CL-SD022-0030-0	Sediment Coring	3 to 4	
	CL-SD024	CL-SD024-0000-0	Sediment Coring	0 to 1	Process residue
	CL-SD024	CL-SD024-0015-0	Sediment Coring	1.5 to 2.5	
	CL-SD028	CL-SD028-0000-0	Sediment Coring	0 to 1.5	Process residue
	CL-SD028	CL-SD028-0030-0	Sediment Coring	3 to 4	
	CL-SD032	CL-SD032-0000-0	Sediment Coring	0 to 1.5	Process residue
	CL-SD032	CL-SD032-0030-0	Sediment Coring	3 to 3.8	
	CL-SD034	CL-SD034-0000-0	Sediment Coring	0 to 1	Process residue
	CL-SD034	CL-SD034-0020-0	Sediment Coring	2 to 3	
	CL-SD037	CL-SD037-0000-0	Sediment Coring	0 to 1	Process residue
	CL-SD037	CL-SD037-0035-0	Sediment Coring	3.5 to 4.5	
West Company Lake	CL-SD038	CL-SD038-0120-0	Split Spoon	12 to 13	Soil, possible process residue
	CL-SD038	CL-SD038-0150-0	Split Spoon	15 to 16	
	CL-SD039	CL-SD039-0075-0	Split Spoon	7.5 to 9	Soil, possible process residue
	CL-SD039	CL-SD039-0120-0	Split Spoon	12 to 13	
	CL-SD040	CL-SD040-0235-0	Split Spoon	23.5 to 25	Soil, possible process residue

Table 3-2
Summary of Soil and Sediment Analytical Methods

Analyte	Analytical Method
Oregon Analytical Laboratory (OAL)	
Total cyanide	EPA 335.2
Fluoride	EPA 340.1/340.2 EPA 300
Total organic carbon (TOC)	EPA 9060
Volatile organic compounds (VOCs)	EPA 8240
Total petroleum hydrocarbons (TPH)	DEQ
Total metals*	CLP
CH2M HILL Redding Laboratory (QAL)	
Polynuclear aromatic hydrocarbons (PAHs)	EPA 8270
Total polychlorinated biphenyls (PCBs)	CLP

*Total metals = aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.

Abbreviations:
CLP = Contract Laboratory Program
DEQ = Oregon Department of Environmental Quality
EPA = U.S. Environmental Protection Agency
QAL = Quality Analytical Laboratories, Inc.

3.5.2 Physical Analysis

Sediment samples shown in Table 3-3 were analyzed for physical parameters by Advanced Terra Testing, Inc., of Lakewood, Colorado. Physical parameters tested and methods are shown in Table 3-4.

4 Results

Results of the bathymetry and topography studies, aquatic plant survey, field sampling observations, physical analysis, chemical analysis, dike construction historical review, and potential flood impact evaluation are provided in the paragraphs that follow.

Table 3-3
Summary of Sediment Samples Selected for Physical Analysis

Study Area	Station Number	Sample Designation	Sampling Method	Sample Depth (feet)	Date Sampled	Laboratory Analysis Performed						Comments
						Moisture Content (ASTM D2216)	Atterberg Limits (ASTM D4318)	Grain Size (ASTM D422)	Hydrometer (ASTM D422)	Specific Gravity (ASTM D854)	Ash/Organic Content (ASTM D2974)	
Company Lake	CL-SD006	CL-SD006-0020-0	Sediment Coring	2 to 3	10/19/96	X	X	X		X		
	CL-SD008	CL-SD008-0010-0	Sediment Coring	1 to 2	10/19/96	X	X					
	CL-SD010	CL-SD010-0000-0	Sediment Coring	0 to 2	10/19/96	X	X				X	Process residue
	CL-SD012	CL-SD012-0015-0	Sediment Coring	1.5 to 3	10/19/96	X	X	X				
	CL-SD014	CL-SD014-0015-0	Sediment Coring	1.5 to 3	10/19/96	X	X					
	CL-SD015	CL-SD015-0010-0	Sediment Coring	1 to 2	10/20/96	X	X					
	CL-SD017	CL-SD017-0015-0	Sediment Coring	1.5 to 3	10/20/96	X	X	X				
	CL-SD023	CL-SD023-0015-0	Sediment Coring	1.5 to 3	10/20/96	X	X	X				
	CL-SD024	CL-SD024-0000-0	Sediment Coring	0 to 1	10/20/96	X		X	X	X	X	Process residue
	CL-SD025	CL-SD025-0010-0	Sediment Coring	1 to 2	10/20/96	X	X					
	CL-SD026	CL-SD026-0020-0	Sediment Coring	2 to 3	10/20/96	X	X					
	CL-SD029	CL-SD029-0020-0	Sediment Coring	2 to 3	10/20/96	X		X				
	CL-SD030	CL-SD030-0000-0	Sediment Coring	0 to 2	10/21/96	X	X				X	Process residue
	CL-SD030	CL-SD030-0030-0	Sediment Coring	3 to 4	10/21/96	X		X				
	CL-SD031	CL-SD031-0035-0	Sediment Coring	3.5 to 5	10/21/96	X	X			X		
	CL-SD035	CL-SD035-0000-0	Sediment Coring	0 to 1	10/21/96	X	X				X	Process residue
	CL-SD035	CL-SD035-0030-0	Sediment Coring	3 to 4	10/21/96	X	X					

Table 3-4
Summary of Physical Test Parameters and Methods

Physical Parameter	Method
Total moisture/solids	ASTM D2216
Atterberg limits (plastic limit, liquid limit)	ASTM D4318
Grain size analysis (< No. 200 sieve)	ASTM D422
Hydrometer	ASTM D4221
Ash content	ASTM D2974
Specific gravity of solids	ASTM D854

Abbreviation: ASTM = American Society for Testing and Materials

4.1 Bathymetry and Topography

Figure 4-1 presents the bathymetric and near-shore topographic features of Company Lake and the outfall ditch. At the time of surveying, the water elevation was 15.2 feet NGVD. There were noticeable differences in the bottom depth between the west and east ends of Company Lake. Water depths along the center channel of the east end reached to an excess of 15 feet (0 feet NGVD); in contrast, the deepest areas in the western half of Company Lake were about 5 feet (10 feet NGVD). Bank slopes were steepest along the southern shore below the dike. The slope of the pond bottom was greatest in the eastern end of the pond. The west half of Company Lake had a much more gently sloping bottom.

Figure 4-2 presents the surface features in and around Company Lake. Visual observations of brick along the north face of the dike (near the shoreline) were performed from a boat. The observations generally indicated that brick covered much of the steep southern bank along the eastern arm of the pond. In areas of 100 percent brick coverage (indicated in Figure 4-2), the observed depth of brick ranged from 1 to 3 feet. In areas with 50 percent brick coverage (indicated in Figure 4-2), bricks were observed only on the surface, and were not found at depth. Only the brick that extended to the shoreline was mapped.

4.2 Aquatic Plant Survey

Aquatic plant distributions are shown in Figure 4-3. The highest densities of aquatic plants were found along the shores and shallow zones. Little or no plant growth was observed in the deeper areas. The profundal zone, or area where light penetration is insufficient for plant growth, started from a depth of 10 to 12 feet. This included much of the center of the treatment pond.

SRB
05-Feb-1997

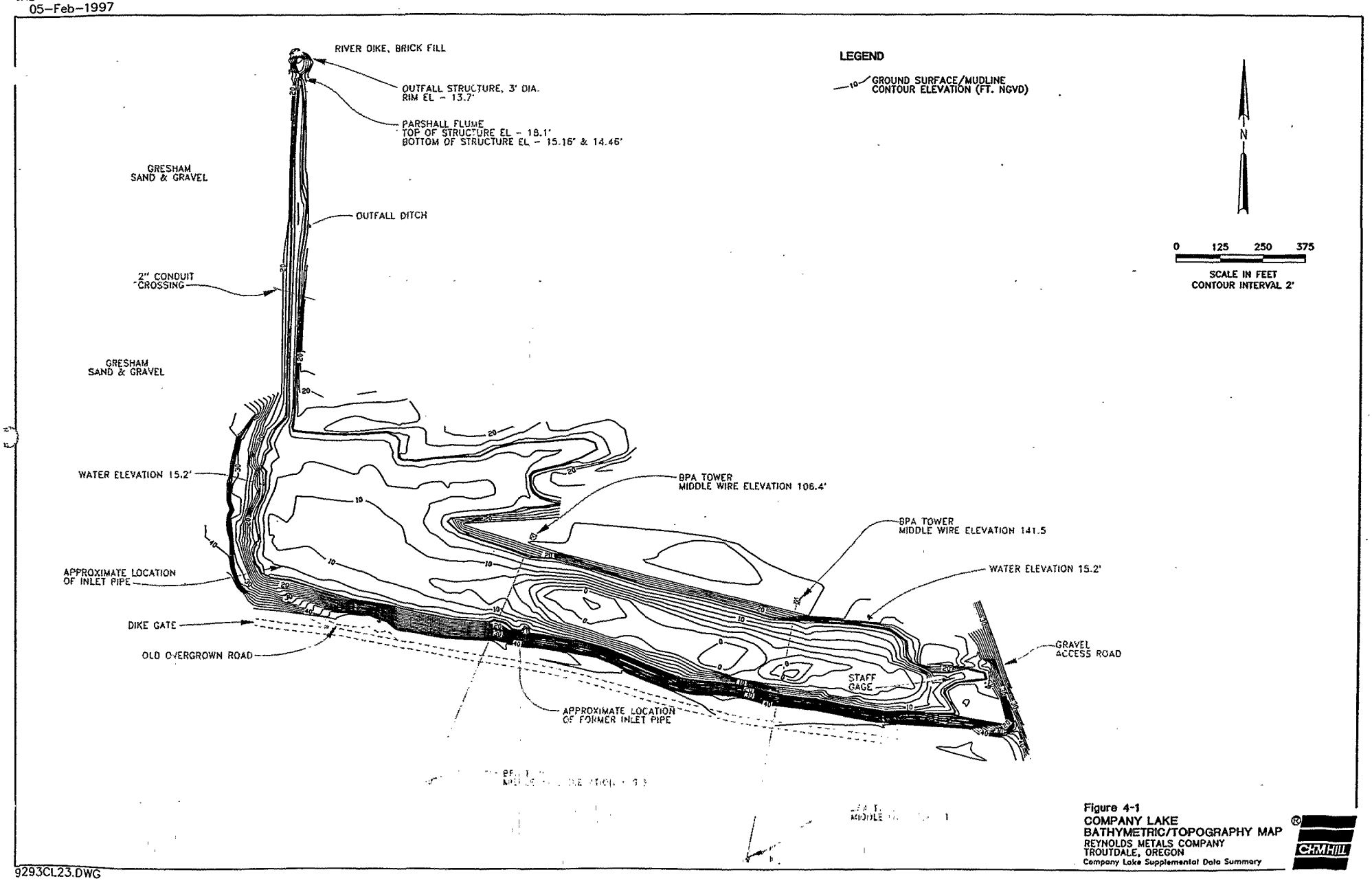


Figure 4-1
COMPANY LAKE
BATHYMETRIC/TOPOGRAPHY MAP
REYNOLDS METALS COMPANY
TROUTDALE, OREGON
Company Lake Supplemental Data Summary

CH2MHILL

9293CL23.DWG

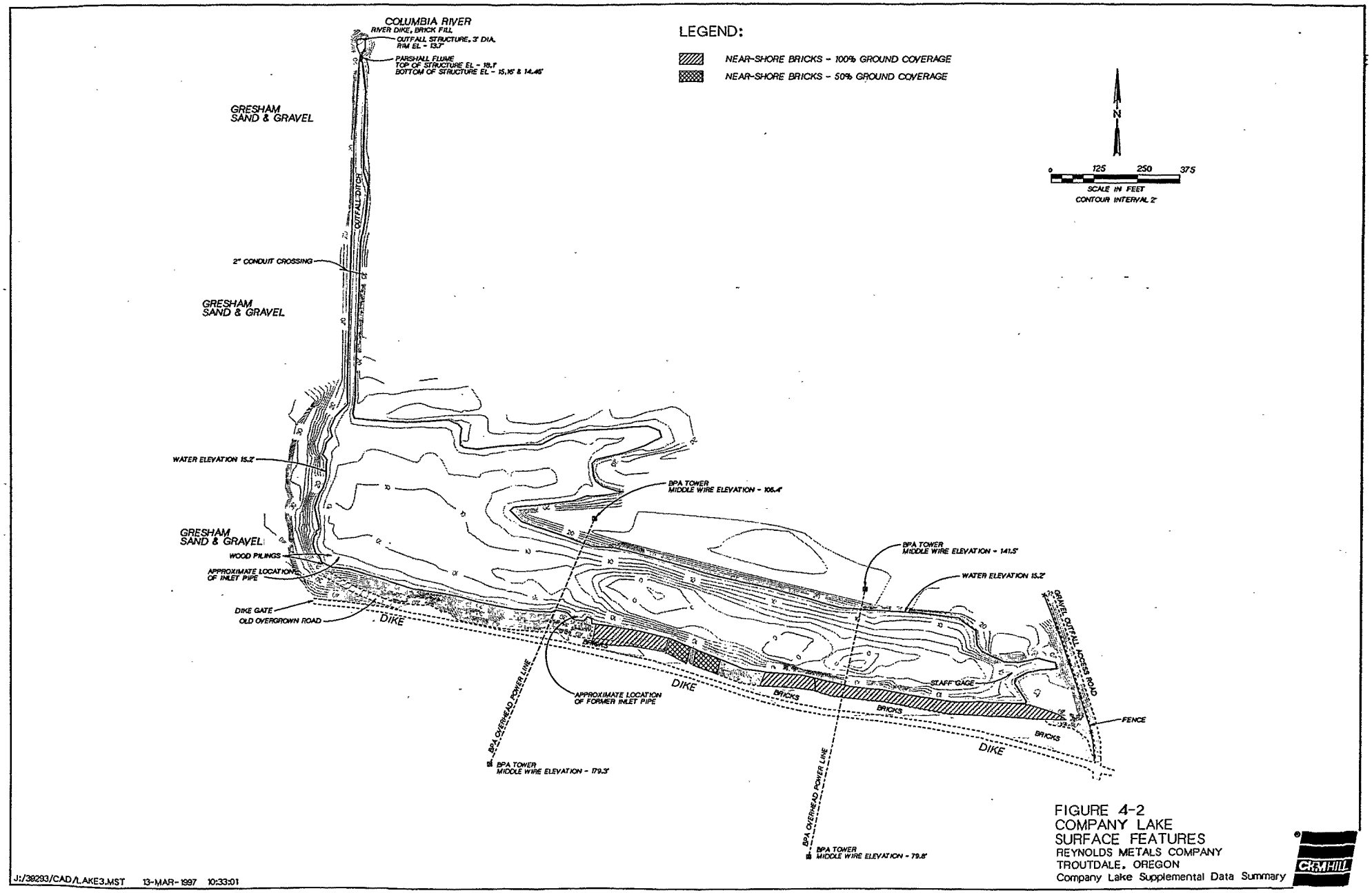


FIGURE 4-2
COMPANY LAKE
SURFACE FEATURES
REYNOLDS METALS COMPANY
TROUTDALE, OREGON
Company Lake Supplemental Data Summary

J:/38293/CAD/LAKE3.MST 13-MAR-1997 10:33:01

9293[redacted]WG

30-Dec-1996

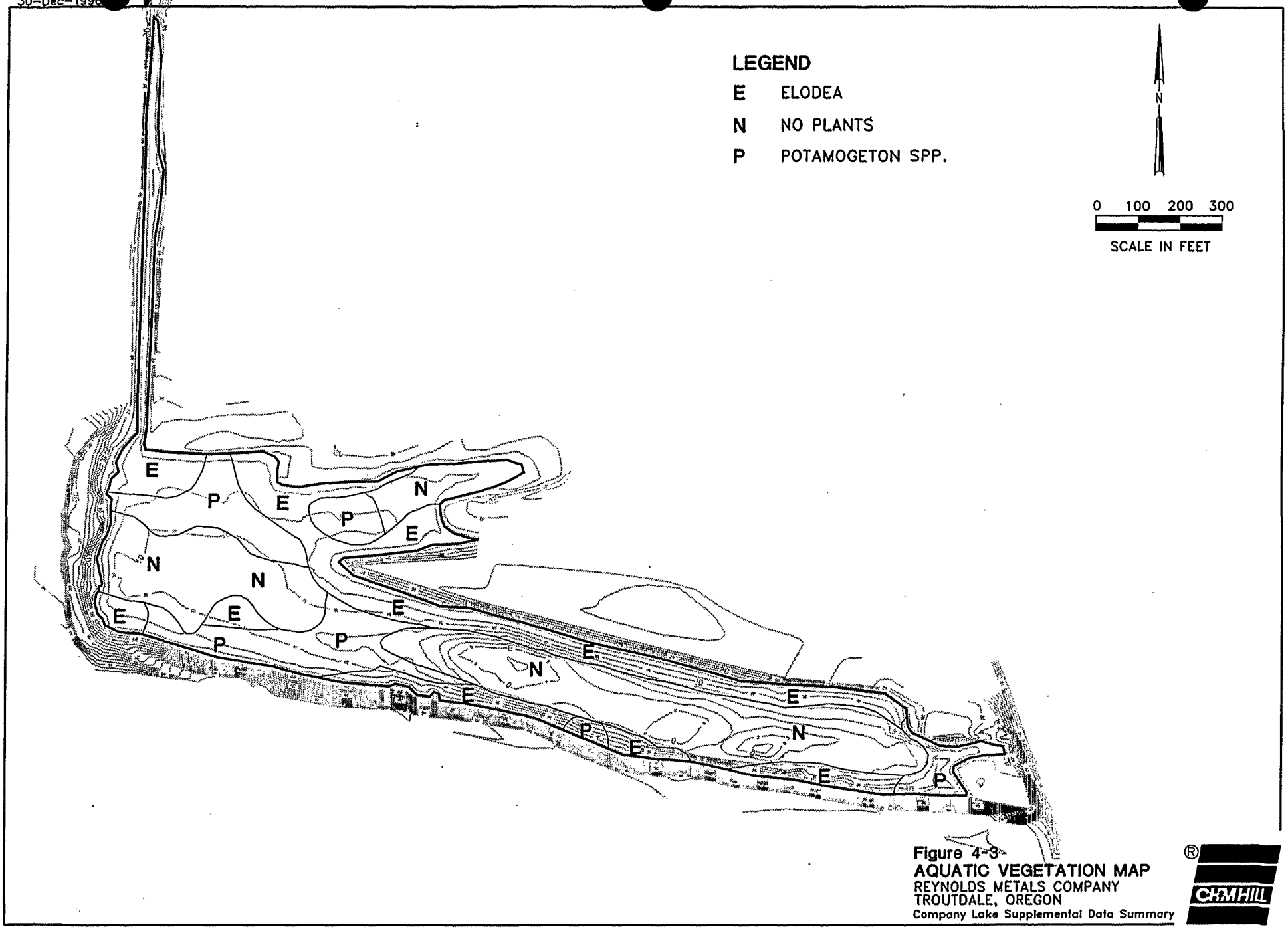


Figure 4-3
AQUATIC VEGETATION MAP
REYNOLDS METALS COMPANY
TROUTDALE, OREGON
Company Lake Supplemental Data Summary

CH2MHILL

9293CL21.DWG

Three major plants were identified: *Elodea canadensis* (waterweed), *Potamogeton crispus* (curly-leaved pondweed), and *Potamogeton zosteriformis* (eelgrass pondweed). The two *Potamogeton* species are grouped in Figure 4-3 for display purposes. The amounts of coverage for the two plants were about equal. Dense stands of waterweed were most common along the shorelines. Stands of eelgrass pondweed and curly-leaved pondweed were less dense and were typically found farther offshore, mostly in the west end of the pond. It was common to find sparse stands of the eelgrass pondweed and curly-leaved pondweed interspersed in the stands of waterweed.

4.3 Field Observations

Section 4.3 describes the field observations during sampling, including sediment and soil sampling, for Company Lake and West Company Lake.

4.3.1 Company Lake

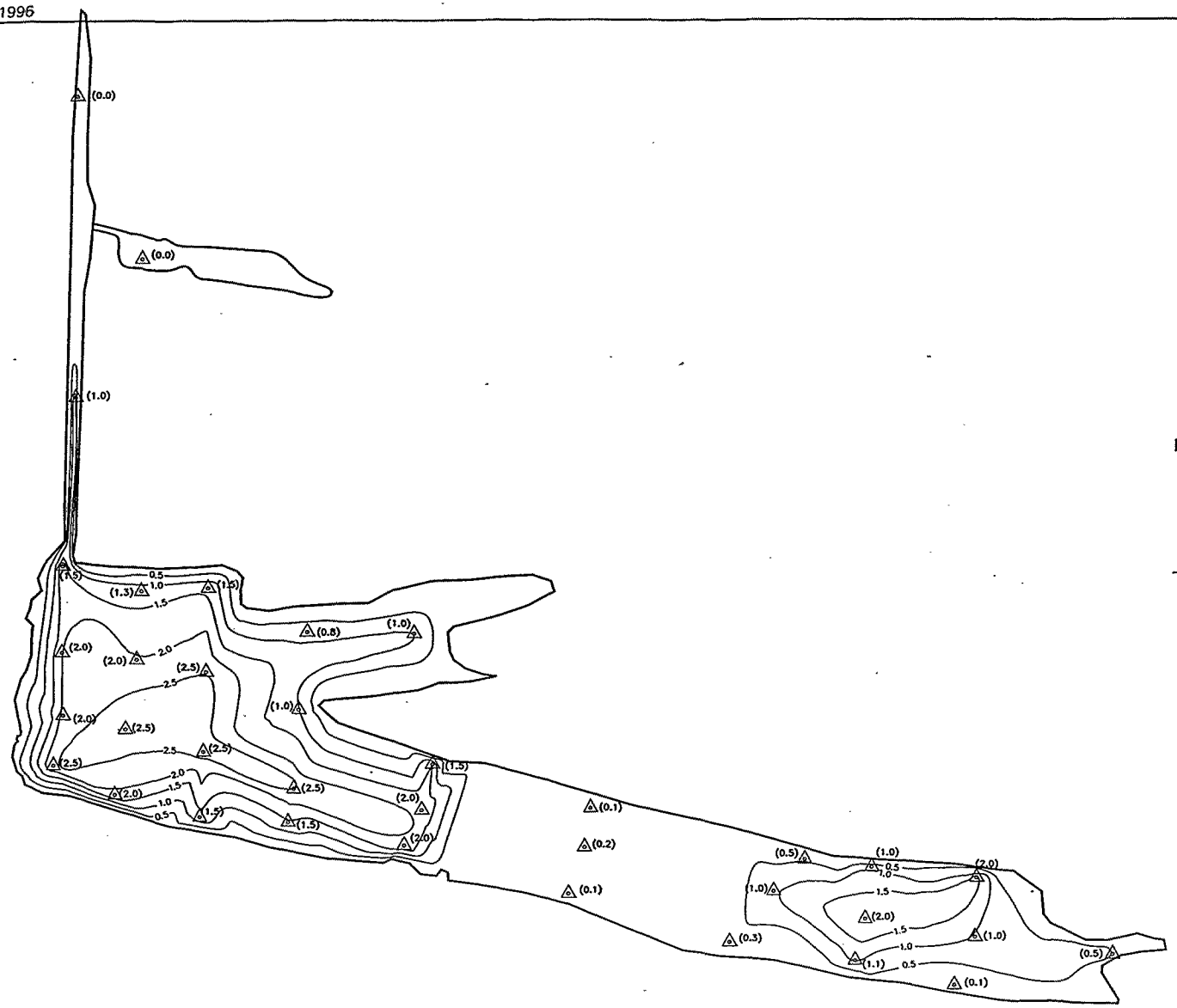
The sediment layers were observed and classified during the sediment core sample collection. After each sample was recovered, sediment was characterized with the United Soils Classification System (USCS). Generally two distinct layers were present in each sample. The top layer consisted of a very soft, dark gray or black material, sometimes with a slight sheen; this is referred to as the "process residue layer." This layer had the consistency of a very wet elastic silt throughout the vertical profile; there was no observed difference (consolidated versus unconsolidated) along the profile. The layer beneath, referred to as the "native sediment layer," was generally composed of silt or sandy silt and was found to be generally free from dark coloration.

Figure 4-4 presents the lateral extent and vertical thickness of the process residue layer observed during sediment coring. The lateral distribution of the process residue layer extends from the west shore of the pond to approximately 850 feet east. The thickness of the layer in this area is 0.5 to 2.5 feet. The process residue layer then decreases to a thickness of 0 to 0.2 foot in the middle portion of the pond. The layer then increases to a thickness of 0.5 to 2.0 feet in the last 800 feet of the eastern section of the pond. A volume of 27,000 cubic yards (yd^3) of process residue material was estimated on the basis of visual identification (that is, the upper dark gray/black layer).

In general, process residue was observed at varying thicknesses (0.1 feet to 2.5 feet) across the entire lateral extent of the pond. Typically, soft to firm silt and sandy silt were identified beneath the process residue layer. In some coring locations, a relatively thin (1- to 12-inch-thick) poorly graded sand layer was observed immediately beneath the process residue layer, and was underlain by the silt and sandy silt described above. Eight cross sections were prepared along north-south transects. These cross sections are presented in Attachment B.

The soil sample obtained within the brick (CL-SD004-0000-0) consisted of a silt with some fine sand. The sample was obtained from soil between and immediately below the bricks.

SRB
31-Dec-1996



LEGEND

- △ BORING LOCATION
- (1.5) THICKNESS OF OBSERVED PROCESS RESIDUE IN FEET
- 0.5 PROCESS RESIDUE THICKNESS CONTOUR (CONTOUR INTERVAL = 0.5 FEET)

Figure 4-4
PROCESS RESIDUE THICKNESS CONTOUR MAP
REYNOLDS METALS COMPANY
TROUTDALE, OREGON
Company Lake Supplemental Data Summary

CH2MHILL

9293CL20.DWG

The sample contained no visible pieces of brick and exhibited no physical indication (color or odor) of process residue.

The soil sample obtained in the depression area east of the outfall ditch (CL-SD002-0000-0) consisted of a silt, with no physical indication (color or odor) of a process residue layer.

4.3.2 West Company Lake

Three borings (CL-SD038, CL-SD039, and CL-SD040) were performed in West Company Lake. An approximate target depth of the process residue layer was calculated on the basis of the elevations of the process residue layer found in Company Lake and the elevation of the ground surface of the borings. In addition, it was thought that the process residue layer would be underlain by the original ground surface that existed before the RMC plant and GS&G facility were constructed, and this surface would be readily identifiable in the samples. Borings were continuously sampled near the target depth to ensure that the layer, if present, could be identified and sampled.

A relatively thin layer of potential process residue was visually identified in Borings CL-SD038 and CL-SD039 at elevations of 12.4 and 13.2 feet NGVD, respectively. The layer was located immediately above what appeared to be the original ground surface, on the basis of visual observation of the samples. The potential process residue layers found in these borings were approximately 6 to 12 inches thick, consisted of dark-gray-stained silt, and did not appear to be composed entirely of process residue, as observed in Company Lake. Samples of this layer and samples below this layer were collected for laboratory analysis. Boring CL-SD040 did not provide any visual evidence of process residue (black staining); however, the collected sample (CL-SD040-0235-0) was at the location where the process residue layer was observed in the other two borings (just above the original ground surface). This sample is considered a potential process residue layer sample, even though it did not exhibit the visual indication (staining) of the process residue layer.

4.4 Physical Analytical Results

Results of physical testing of selected sediments are presented in Table 4-1. Pertinent laboratory results are presented in Attachment C. The process residue tests indicated a USCS classification of MH (elastic silt). Water content of the process residue ranged from 246.1 to 311.7 percent, and the fine-grained (silt/clay) content was 97.1 percent by weight.

The native sediments found below the process layer consisted mainly of silt or sandy silt, with a water content ranging from 31.8 to 75.1 percent. The silt/clay content ranged from 57.1 to 81.1 percent by weight.

4.5 Chemical Analytical Results

The following subsections provide a summary of chemical constituents in the Company Lake sediments, West Company Lake soil, and soil samples collected in the brick and in the depression east of the outfall ditch.

4.5.1 Company Lake Sediment

Results for the process residue and native sediments are discussed in the paragraphs that follow. Data on both sediment layers are compared to evaluate potential effects of the

Table 4-1
Summary of Laboratory Physical Analytical Results

Station Number	Sample Designation	Sample Depth (feet)	Laboratory Analytical Results							Comments
			Moisture Content (%) (ASTM D2216)	Atterberg Limits (ASTM D4318)		% Passing #200 Sieve (ASTM D422)	USCS Classification (ASTM 2487)	Specific Gravity (ASTM D854)	Ash/Organic Content (%) (ASTM D2974)	
				LL	PI					
CL-SD006	CL-SD006-0020-0	2 to 3	44.1	32.1	4.8	80.8	ML	2.66		
CL-SD008	CL-SD008-0010-0	1 to 2	33.9	28.2	2.8		ML			
CL-SD010	CL-SD010-0000-0	0 to 2	246.1	62.6	13.8		MH		4.5	Process residue
CL-SD012	CL-SD012-0015-0	1.5 to 3	31.8	NP	NP	65.8	ML			
CL-SD014	CL-SD014-0015-0	1.5 to 3	50.6	34.3	4.6		ML			
CL-SD015	CL-SD015-0010-0	1 to 2	38.9	31.2	5.8		ML			
CL-SD017	CL-SD017-0015-0	1.5 to 3	36	NP	NP	57.1	ML			
CL-SD023	CL-SD023-0015-0	1.5 to 3	26.2	NP	NP	57.5	ML			
CL-SD024	CL-SD024-0000-0	0 to 1	248.4			97.1		2.58	6.5	Process residue
CL-SD025	CL-SD025-0010-0	1 to 2	58.4	42.3	9.6		ML			
CL-SD026	CL-SD026-0020-0	2 to 3	50.7	45.5	13		ML			
CL-SD029	CL-SD029-0020-0	2 to 3	41.7			81.1				
CL-SD030	CL-SD030-0000-0	0 to 2	311.7	NP	NP				11.1	Process residue
CL-SD030	CL-SD030-0030-0	3 to 4	29.8			1.7	SP			
CL-SD031	CL-SD031-0035-0	3.5 to 5	45.4	39.7	9.4		ML	2.62		
CL-SD035	CL-SD035-0000-0	0 to 1	286.2	67.6	2.9		MH		9.2	Process residue
CL-SD035	CL-SD035-0030-0	3 to 4	75.1	46.3	14.6		ML			

Abbreviations:
MH = elastic silt
ML = silt
NP = nonplastic
SP = poorly graded sand

process residue on the underlying native sediment. Additionally, the 1996 process residue data are compared with process residue data collected in 1994.

Process Residue Layer

Fifteen sediment samples from the process residue layer were analyzed for the suite of constituents described earlier. A summary of analytical results is provided in Table 4-2, and these results are discussed below. All the data are provided in Attachment D, Table D-1.

Cyanide. Cyanide was detected in 9 of the 15 process residue layer samples. Detections ranged from 1.3 to 7.9 milligrams per kilogram (mg/kg). The highest concentration, 7.9 mg/kg, was found at CL-SD013, at the east end of the pond.

Fluoride. Fluoride was detected in all 15 process residue layer samples analyzed. Concentrations by EPA Method 340.1/.2 ranged from 7,000 to 57,000 mg/kg. The highest concentration by Method 340.1/.2 occurred at CL-SD032, in the west end of the pond. Fluoride by Method 300.0 ranged from 3.5 to 170 mg/kg. The highest concentration by Method 300.0 occurred at CL-SD019, near the middle of the pond.

Total Metals. Of 23 metals, total metals were detected in nearly all samples tested. The exceptions were antimony, silver, and thallium, which were detected in only one sample at concentrations near the detection limits.

Polynuclear aromatic hydrocarbons (PAHs). Of 17 PAHs, 14 were detected in the process residue. Total PAH concentrations ranged from 3.6 to 1,584 mg/kg. The highest concentration was reported in the east end of the pond, at Station CL-SD011.

Polychlorinated biphenyls (PCBs). PCBs were detected in 5 of the 15 samples. Detected total PCBs ranged from 0.45 to 3.1 mg/kg. Aroclors 1248 and 1268 were the only aroclors, with maximum concentrations of 2.1 and 0.96 mg/kg, respectively.

Total petroleum hydrocarbons (TPH). Diesel was detected in six samples, at concentrations ranging from 280 to 2,200 mg/kg. The highest concentration (2,200 mg/kg) was found at CL-SD034 (at the southern end of the outfall ditch) and was considerably higher than values found at other stations. The next highest concentration was 1,400 mg/kg at Station CL-SD037. Other TPH (gasoline or heavy oil) was not detected in any samples.

VOCs. VOCs were not reported above detection limits for any sample analyzed.

Native Sediment Layer

Fourteen native sediment samples were collected from below the process residue layer and analyzed for the suite of constituents. A summary of analytical results is provided in Table 4-3. All the data are provided in Attachment D, Table D-2.

Cyanide. No cyanide was detected in any of the 14 samples.

Fluoride. Fluoride was detected in all 14 samples. Fluoride (Method 340.1/340.2) concentrations ranged from 300 to 3,300 mg/kg. The highest detection (3,300 mg/kg) was found at CL-SD034, at the entrance to the outfall ditch. Fluoride (Method 300.0) concentrations ranged from 14 to 89 mg/kg.

Total Metals. Antimony, mercury, selenium, silver, and thallium were not detected in any of the samples analyzed. All samples contained varying amounts of the other metals for

Table 4-2
Summary of Process Residue Data for Company Lake

Analyte (mg/kg)*	No. of Samples	No. of Detects	Minimum Detect	Maximum Detect	Minimum Nondetect	Maximum Nondetect
Cyanide, Total	15	9	1.3	7.9	1	1
Fluoride by 340.1/.2	15	15	7000	57000		
Fluoride By 300.0	15	15	3.5	170		
Total Organic Carbon	15	15	20100	185000		
Total Metals						
Aluminum	15	15	16100	74200		
Antimony	15	1		3.6	2.5	10
Arsenic	15	15	5.03	16.5		
Barium	15	15	87.1	267		
Beryllium	15	15	0.85	3.39		
Cadmium	15	14	0.76	8.44	0.5	0.5
Calcium	15	15	10100	70500		
Chromium	15	15	20.8	123		
Cobalt	15	15	6.82	32.2		
Copper	15	15	43.3	288		
Iron	15	15	9500	26500		
Lead	15	15	23.8	114		
Magnesium	15	15	1700	5920		
Manganese	15	15	155	2220		
Mercury	15	15	0.23	1.07		
Nickel	15	15	42.5	790		
Potassium	15	15	715	3350		
Selenium	15	14	1.3	6.7	1	1
Silver	15	1		1.1	1	1.5
Sodium	15	15	1260	6800		
Thallium	15	1		1.3	1	1
Vanadium	15	15	62.2	271		
Zinc	15	15	73.9	1010		
PAHs						
2-Methylnaphthalene	15	0			0.49	100
Acenaphthene	15	2	0.17	0.98	0.49	100
Acenaphthylene	15	0			0.49	100
Anthracene	15	15	0.064	26		
Benzo(a)anthracene	15	15	0.56	220		
Benzo(a)pyrene	15	15	0.055	180		
Benzo(b)fluoranthene	15	15	0.38	370		
Benzo(g,h,i)perylene	15	7	1.3	120	0.49	47
Benzo(k)fluoranthene	15	15	0.25	150		
Chrysene	15	15	0.78	460		
Dibenzo(a,h)anthracene	15	10	0.062	22	0.49	100
Fluoranthene	15	13	1	180	24	26
Fluorene	15	7	0.17	11	1.9	100
Indeno(1,2,3-c,d)pyrene	15	13	1.4	93	0.49	0.6
Naphthalene	15	0			0.01	0.02
Phenanthrene	15	14	0.12	39	100	100
Pyrene	15	15	0.21	160		
PCBs						
Aroclor 1262	15	0			0.049	2.1
Aroclor 1016	15	0			0.049	2.1
Aroclor 1221	15	0			0.1	4.2
Aroclor 1232	15	0			0.049	2.1
Aroclor 1242	15	0			0.049	2.1
Aroclor 1248	15	4	0.42	2.1	0.55	2.1
Aroclor 1254	15	0			0.049	2.1
Aroclor 1260	15	0			0.049	2.1
Aroclor 1268	15	3	0.59	0.96	0.049	2.1
TPH						
TPH (HCID)	15	6				
Diesel by 8015	15	6	280	2200	2	2
Gasoline	15	0				
Heavy Oil	15	0				

* Summary of volatile organic compounds not shown; all analytes below detection limits (see Attachment D, Table D-1).

Abbreviation: HCID = hydrocarbon identification

Table 4-3
Summary of Company Lake Native Sediment Data and Columbia River Background Metals Data

Analyte (mg/kg)[a]	Company Lake						Columbia River Background[b]	
	No. of Samples	No. of Detects	Minimum Detect	Maximum Detect	Minimum Nondetect	Maximum Nondetect	Minimum Detect	Maximum Detect
Cyanide, Total	14	0			1	1		
Fluoride by 340.1/.2	14	14	300	3300				
Fluoride By 300.0	14	14	14	89				
Total Organic Carbon	14	14	2060	16400				
Total Metals								
Aluminum	14	14	8190	24000			5000	16300
Antimony	14	0			2.5	2.5		
Arsenic	14	14	2.2	10.1			1.5	4.4
Barium	14	14	40.4	171			60.8	164.5
Beryllium	14	2	0.6	0.62	0.5	0.5	0.62	0.68
Cadmium	14	2	0.63	0.76	0.5	0.5	0.13	1.9
Calcium	14	14	3890	7030			2400	3600
Chromium	14	14	12.2	28			5.47	18.9
Cobalt	14	14	5.58	11.6			11	12
Copper	14	14	14.8	43.3			2.39	24.8
Iron	14	14	12900	29800			10243	18900
Lead	14	11	5.6	36.9	5	5	4.8	17.6
Magnesium	14	14	1650	5920			2700	3500
Manganese	14	14	103	415			270	270
Mercury	14	0			0.2	0.2	0.07	0.08
Nickel	14	14	9.93	38.4			9.3	18
Potassium	14	14	476	2050			440	770
Selenium	14	0			1	1		
Silver	14	0			1	1		
Sodium	14	14	483	967			200	220
Thallium	14	0			1	1		
Vanadium	14	14	43.6	64.4			45	46
Zinc	14	14	28.9	138			44	155
PAHs								
2-Methylnaphthalene	14	0			0.43	0.56		
Acenaphthene	14	1	0.092	0.092	0.43	0.56		
Acenaphthylene	14	0			0.43	0.56		
Anthracene	14	0			0.43	0.56		
Benzo(a)anthracene	14	4	0.06	0.2	0.45	0.56		
Benzo(a)pyrene	14	3	0.056	0.2	0.45	0.54		
Benzo(b)fluoranthene	14	5	0.045	0.26	0.45	0.56		
Benzo(g,h,i)perylene	14	2	0.068	0.071	0.45	0.56		
Benzo(k)fluoranthene	14	3	0.078	0.14	0.45	0.56		
Chrysene	14	7	0.061	0.29	0.45	0.56		
Dibenzo(a,h)anthracene	14	0			0.43	0.56		
Fluoranthene	14	4	0.056	0.44	0.45	0.56		
Fluorene	14	0			0.43	0.56		
Indeno(1,2,3-cd)pyrene	14	1	0.082	0.082	0.43	0.56		
Naphthalene	14	0			0.01	0.01		
Phenanthrene	14	0			0.43	0.56		
Pyrene	14	3	0.061	0.07	0.45	0.56		
PCBs								
Aroclor 1016	14	0			0.043	0.056		
Aroclor 1221	14	0			0.088	0.11		
Aroclor 1232	14	0			0.043	0.056		
Aroclor 1242	14	0			0.043	0.056		
Aroclor 1248	14	0			0.043	0.056		
Aroclor 1254	14	0			0.043	0.056		
Aroclor 1260	14	0			0.043	0.056		
Aroclor 1262	14	0			0.043	0.056		
Aroclor 1268	14	0			0.043	0.056		
TPH								
TPH (HCID)	14	0						

[a] Summary of volatile organic compounds not shown; all analytes below detection limits (see Attachment D, Table D-2).
[b] Only data on metals shown for comparison. From Technical Memorandum DS No. 12, *Background Data Summary for RMC-Troutdale* (CH2M HILL, November 22, 1996).
Abbreviation: HCID = hydrocarbon identification

which analyses were performed. Because metals occur naturally in soil and sediment, detected background metal concentration ranges for the Columbia River are also shown in Table 4-3. Native sediment metal concentrations in Company Lake were generally within the sediment background ranges; only calcium and potassium appeared to be at much higher concentrations in Company Lake sediment than in Columbia River sediment.

PAHs. PAHs were detected in 8 of the 14 samples. Total PAH concentrations ranged from 0.061 to 1.23 mg/kg.

PCBs. PCBs were undetected in all 14 samples.

TPH. Petroleum hydrocarbons were undetected in all 14 samples.

VOCs. VOCs were undetected in all 14 samples.

Comparison Between Process Residue and Native Sediment

The analytical results for the process residue and native sediment were compared to evaluate which constituents might have leached and been transported from the overlying process residue layer to the underlying native sediment. This evaluation provides some insight into the potential for groundwater to be affected by the process residue. Table 4-4 provides a comparison of the two sediment layers. The concentrations in the process residue were much greater than those in the native sediment for fluoride (Method 340.1/.2), metals, and PAHs. As discussed earlier, it does not appear the metals have leached significantly to the native sediment because concentrations in the native sediment are similar to background concentrations. Cyanide, PCBs, and TPH were detected in the process residue layer but not in the underlying native sediment.

The most notable comparison between the two sediment layers was that for fluoride. Fluoride concentrations measured by EPA Method 340.1/.2 are thought to represent a total concentration of fluoride. Concentrations of total fluoride in the process residue were much greater than those found in the native sediment (Figure 4-5). In contrast, fluoride concentrations measured by Method 300.0 were quite similar in both sediment layers (Figure 4-6). Method 300.0 is a leaching test and is believed to represent soluble fluoride. Additional investigation into these two fluoride methods is being conducted to more fully understand how results obtained with the methods relate to soil concentrations and leachability. However, on the basis of our current understanding of fluoride methods, it appears that the underlying sediments are affected by soluble fluoride. This result suggests that groundwater downgradient of Company Lake may also be affected by fluoride. Fluoride transport could result from surface water discharge to groundwater, from leaching of sediments, or both.

Comparison with 1994 Data

CH2M HILL sampled surface sediments (process residue) in Company Lake as part of the removal site assessment (RSA) in 1994. Six samples (including one in the outfall ditch) were collected in a grab sampler and analyzed for cyanide, fluoride, total organic carbon (TOC), metals, PAHs, PCBs, and TPH. Sample locations are shown in Figure 4-7. Sampling methods and results are summarized in the Draft CSS (CH2M HILL, April 5, 1996).

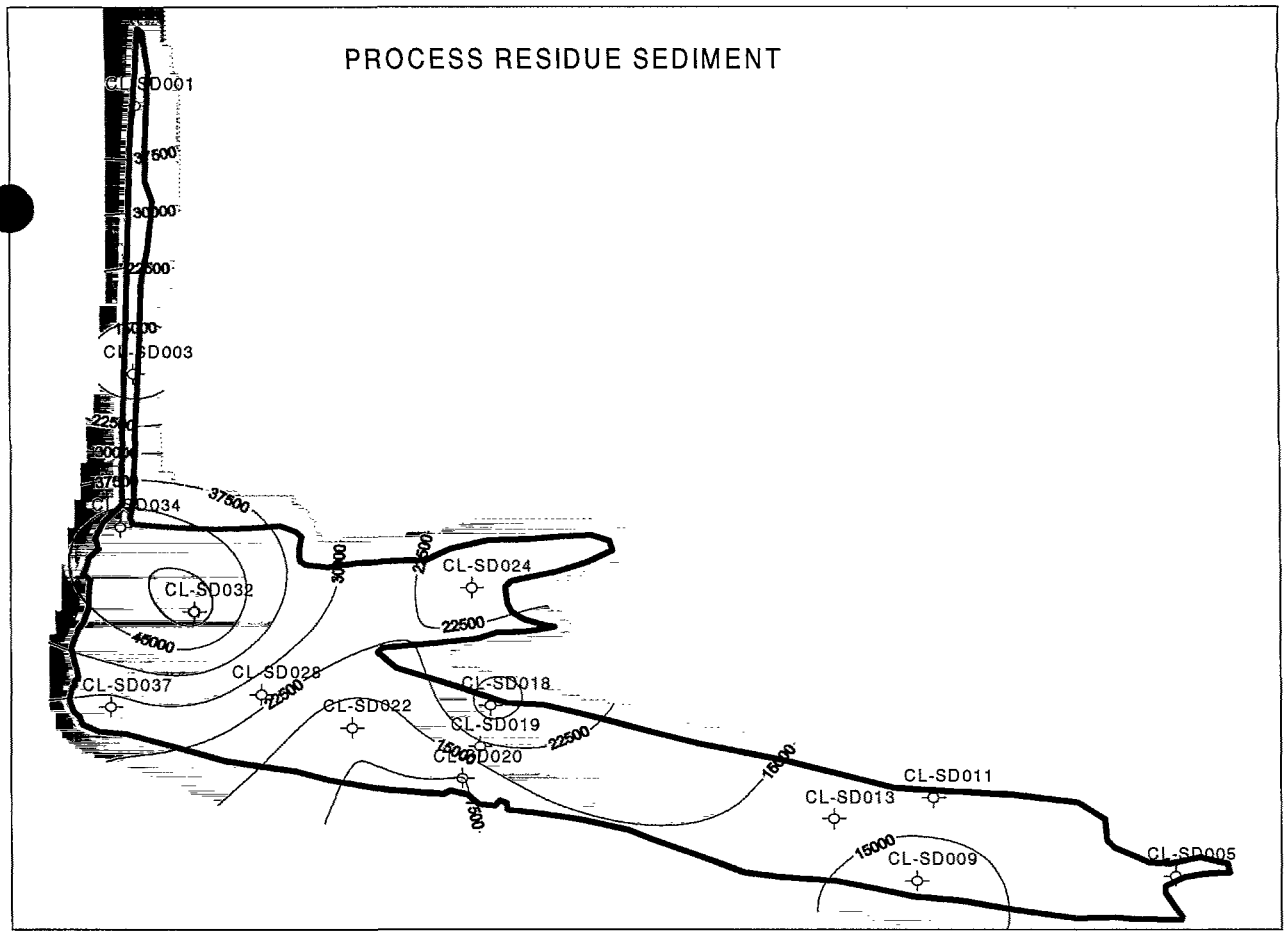
A recent independent review of laboratory QA/QC procedures for the 1994 sediment data has revealed several problems with the 1994 data set; as a result, data previously reported

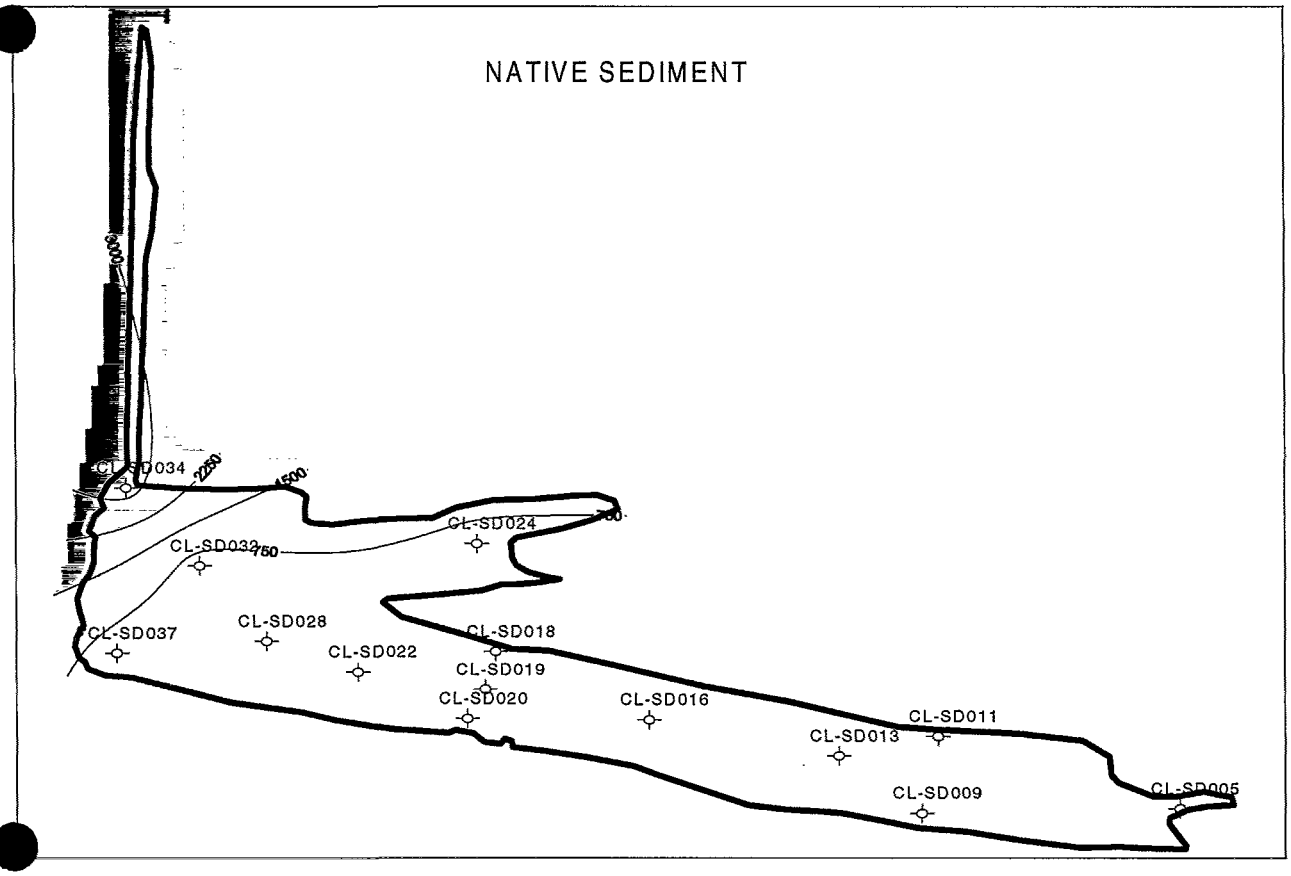
Table 4-4
Comparison of 1996 Process Residue and Native Sediment Data for Company Lake

Analyte (mg/kg)*	Process Residue				Native Sediment			
	No. of Samples	No. of Detects	Minimum Detect	Maximum Detect	No. of Samples	No. of Detects	Minimum Detect	Maximum Detect
Cyanide, Total	15	9	1.3	7.9	14	0		
Fluoride by 340.1/.2	15	15	7000	57000	14	14	300	3300
Fluoride By 300.0	15	15	3.5	170	14	14	14	89
Total Organic Carbon	15	15	20100	185000	14	14	2060	16400
Total Metals								
Aluminum	15	15	16100	74200	14	14	8190	24000
Antimony	15	1		3.6	14	0		
Arsenic	15	15	5.03	16.5	14	14	2.2	10.1
Barium	15	15	87.1	267	14	14	40.4	171
Beryllium	15	15	0.85	3.39	14	2	0.6	0.62
Cadmium	15	14	0.76	8.44	14	2	0.63	0.76
Calcium	15	15	10100	70500	14	14	3890	7030
Chromium	15	15	20.8	123	14	14	12.2	28
Cobalt	15	15	6.82	32.2	14	14	5.58	11.6
Copper	15	15	43.3	288	14	14	14.8	43.3
Iron	15	15	9500	26500	14	14	12900	29800
Lead	15	15	23.8	114	14	11	5.6	36.9
Magnesium	15	15	1700	5920	14	14	1650	5920
Manganese	15	15	155	2220	14	14	103	415
Mercury	15	15	0.23	1.07	14	0		
Nickel	15	15	42.5	790	14	14	9.93	38.4
Potassium	15	15	715	3350	14	14	476	2050
Selenium	15	14	1.3	6.7	14	0		
Silver	15	1		1.1	14	0		
Sodium	15	15	1260	6800	14	14	483	967
Thallium	15	1		1.3	14	0		
Vanadium	15	15	62.2	271	14	14	43.6	64.4
Zinc	15	15	73.9	1010	14	14	28.9	138
PAHs								
2-Methylnaphthalene	15	0			14	0		
Acenaphthene	15	2	0.17	0.98	14	1		0.092
Acenaphthylene	15	0			14	0		
Anthracene	15	15	0.064	26	14	0		
Benzo(a)anthracene	15	15	0.56	220	14	4	0.06	0.2
Benzo(a)pyrene	15	15	0.055	180	14	3	0.056	0.2
Benzo(b)fluoranthene	15	15	0.38	370	14	5	0.045	0.26
Benzo(g,h,i)perylene	15	7	1.3	120	14	2	0.068	0.071
Benzo(k)fluoranthene	15	15	0.25	150	14	3	0.078	0.14
Chrysene	15	15	0.78	460	14	7	0.061	0.29
Dibenzo(a,h)anthracene	15	10	0.062	22	14	0		
Fluoranthene	15	13	1	180	14	4	0.056	0.44
Fluorene	15	7	0.17	11	14	0		
Indeno(1,2,3-cd)pyrene	15	13	1.4	93	14	1		0.082
Naphthalene	15	0			14	0		
Phenanthrene	15	14	0.12	39	14	0		
Pyrene	15	15	0.21	160	14	3	0.061	0.07
PCBs								
Aroclor 1016	15	0			14	0		
Aroclor 1221	15	0			14	0		
Aroclor 1232	15	0			14	0		
Aroclor 1242	15	0			14	0		
Aroclor 1248	15	4	0.42	2.1	14	0		
Aroclor 1254	15	0			14	0		
Aroclor 1260	15	0			14	0		
Aroclor 1262	15	0			14	0		
Aroclor 1268	15	3	0.59	0.96	14	0		
TPH								
TPH (HCID)	15	6	NA	NA	14	0		
Diesel by 8015	15	6	280	2200				
Gasoline	15	0						
Heavy Oil	15	0						

* VOCs analyzed but not detected in process residue or native sediment.

Abbreviations:
HCID = hydrocarbon identification
NA = not applicable
U = undetected





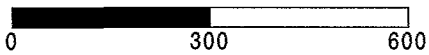
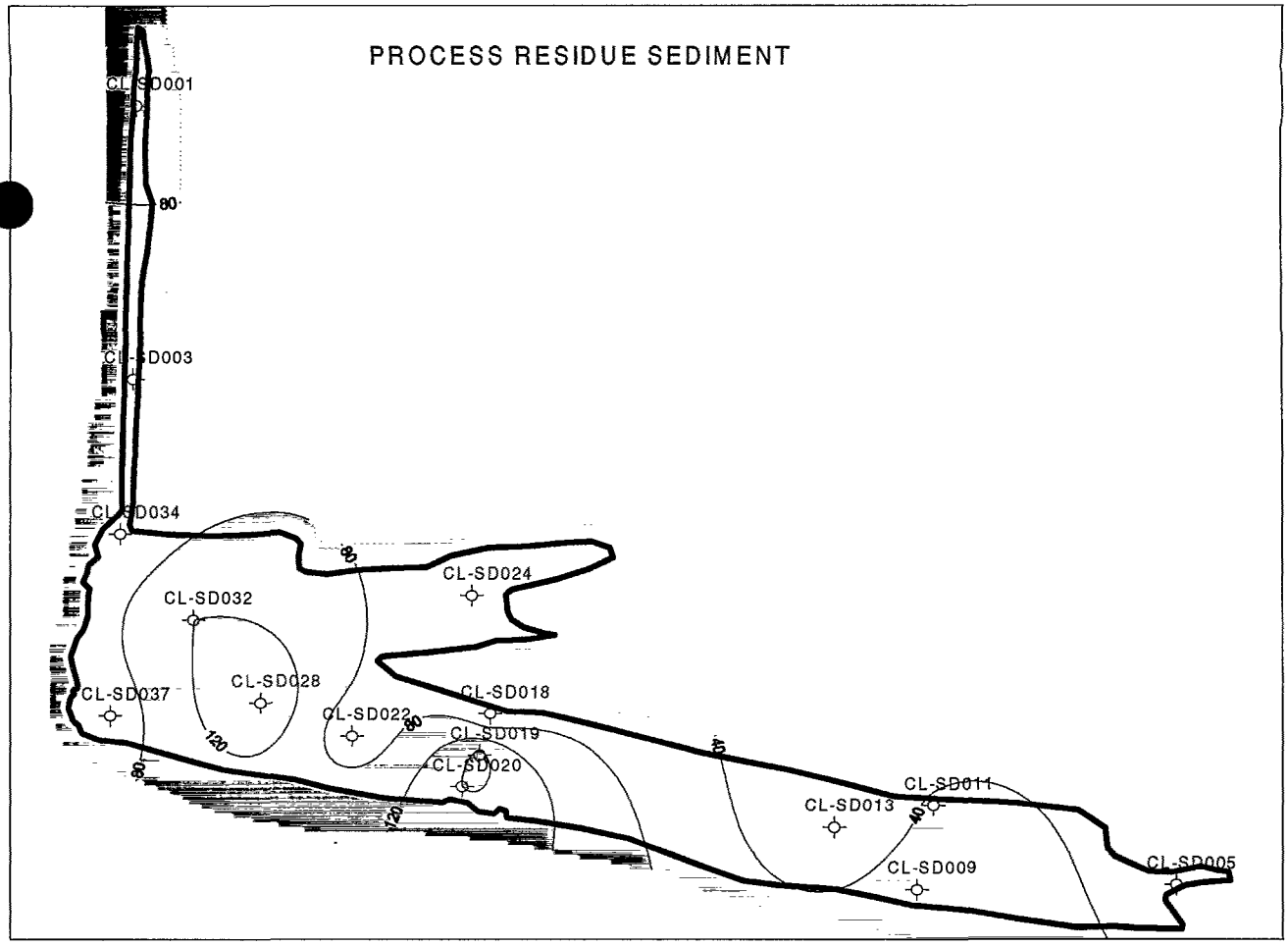


Figure 4-5
Fluoride (Method 340.1/.2) in Company Lake Sediment
Reynolds Metals Company
Troutdale, Oregon
Company Lake Supplemental Data Summary



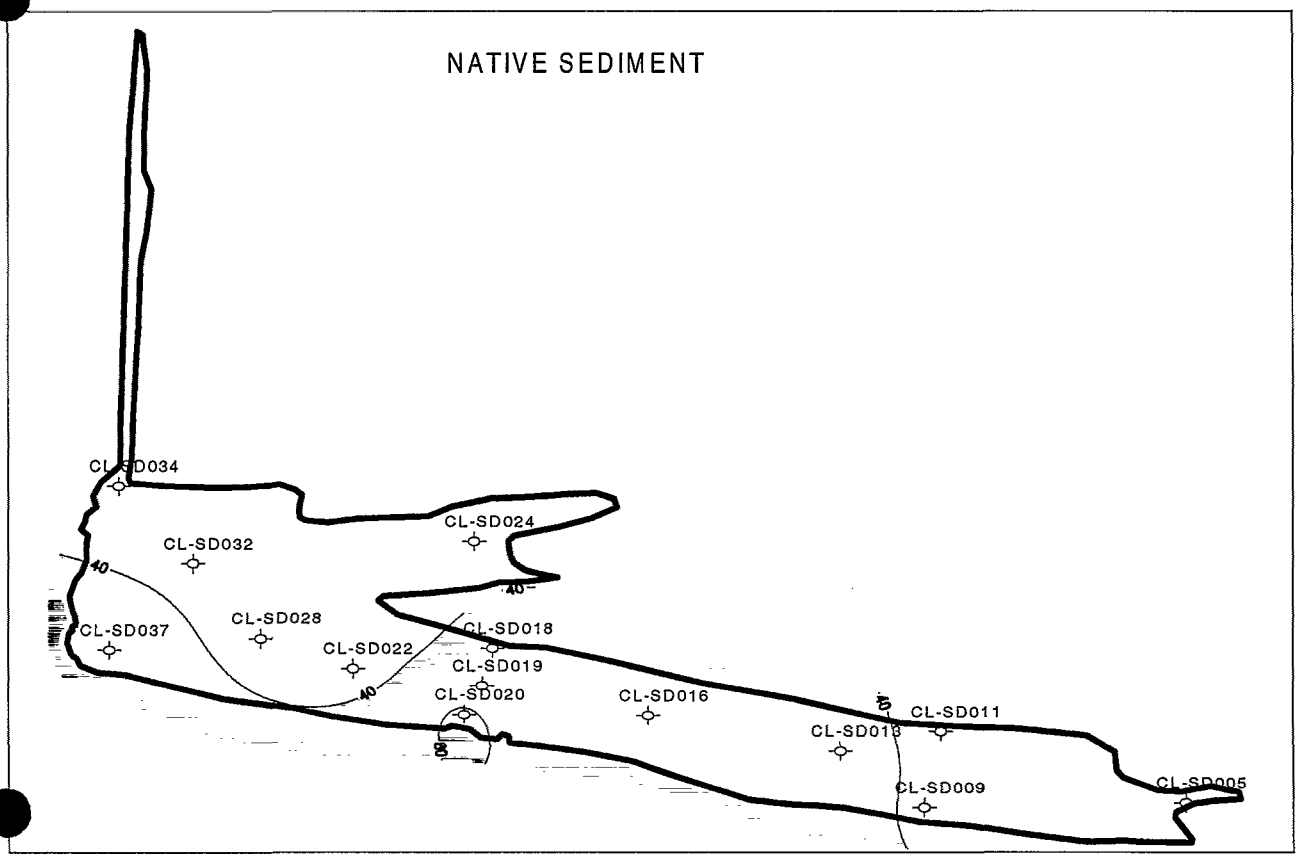


Figure 4-6
Fluoride (Method 300.0) in Company Lake Sediment
Reynolds Metals Company
Troutdale, Oregon
Company Lake Supplemental Data Summary

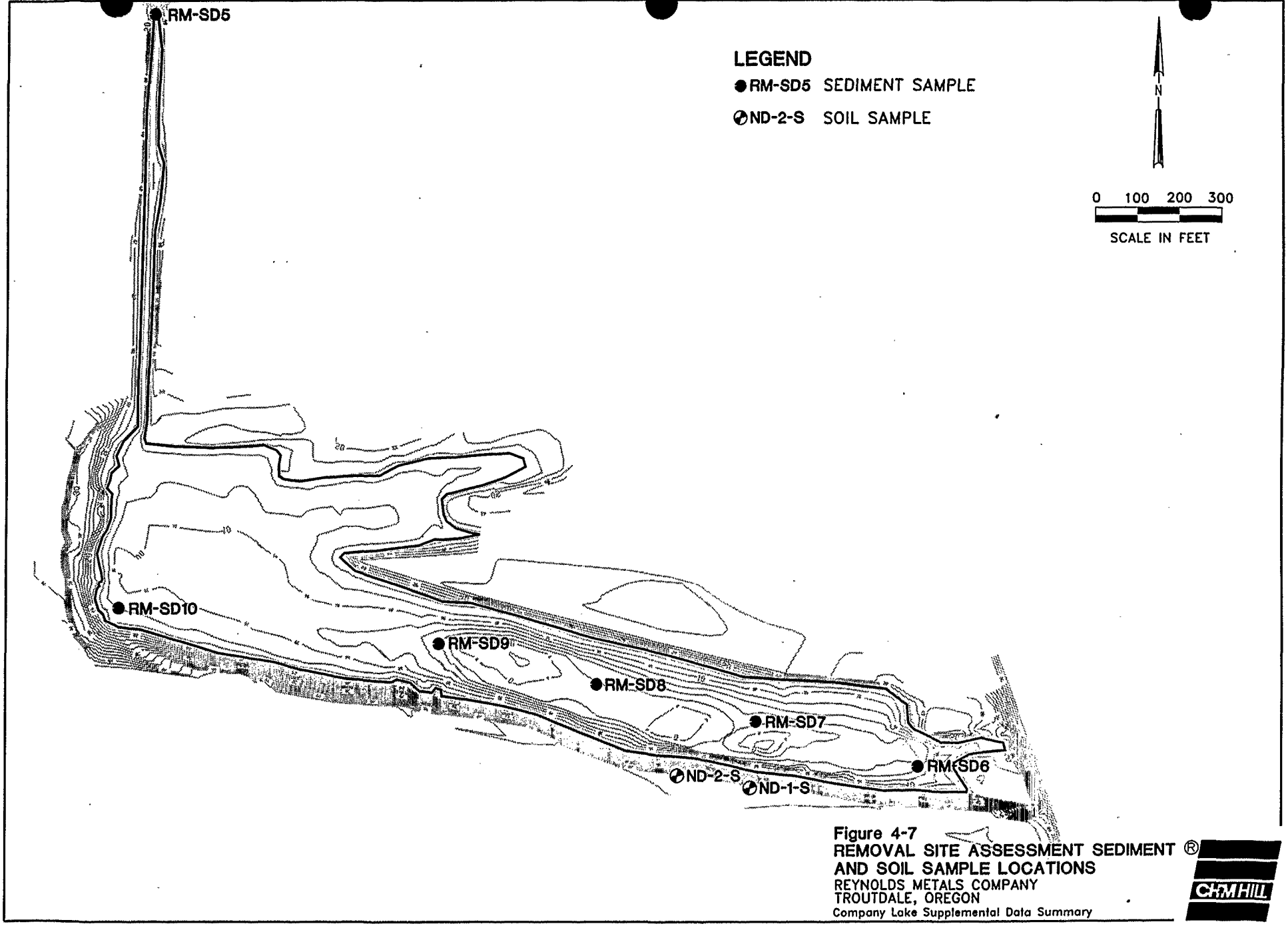


Figure 4-7
REMOVAL SITE ASSESSMENT SEDIMENT ® AND SOIL SAMPLE LOCATIONS
REYNOLDS METALS COMPANY
TROUTDALE, OREGON
Company Lake Supplemental Data Summary

CH2MHILL

as acceptable have been rejected. Most notably, the PAH data were analyzed by EPA Method 8270-SIM (selected ion monitoring), which is intended for low-PAH samples. Because the PAH concentrations are relatively high in Company Lake, the detected concentrations were outside the range of calibration. Other analyte data (fluoride, TOC, metals, PCBs, and TPH) were also rejected because the detected concentrations were outside the calibration range. On the basis of this review of the calibration and sample data, it was determined that the laboratory did not dilute and reanalyze to accurately quantify these higher concentrations, and therefore the data should not be used quantitatively. However, the data may be used qualitatively, that is, to indicate that a substance was detected at an unspecified concentration.

Table 4-5 provides the requalified data for the 1994 sampling event. The "RC" qualified data are the rejected data. The "JC" indicates that the laboratory reported the results for higher dilutions, even though the protocol dictated that the lower dilution results be reported. "JC" values should be used with caution because the data are less accurate and precise.

Table 4-6 provides a comparison between process residue concentrations for the 1996 and 1994 sampling events. Only analytes for which there were acceptable 1994 data are shown. Different collection methods were used for the two sampling events, and thus their comparability might have been affected: the 1994 samples were collected as a surface grab (from the top 0.1 foot) and the 1996 samples were collected from cores (from the top 1 to 1.5 feet). With this caveat, the data indicate that most constituents were similar in the two sampling events. Metal concentrations appeared to be higher for 1996, but this result may have been caused by the low number of acceptable 1994 values or the difference in sampling methods. Some individual 1996 PAH concentrations shown in Table 4-6 were lower than 1994 concentrations; it is uncertain whether these differences are a result of the sampling method or the 1994 data quality.

4.5.2 Dike Brick Soil Sample

A soil sample (CL-SD004-000-0) was collected from the base of the brick area along the dike on the south shore of Company Lake. The purpose of the sample was to evaluate brick as a potential source to groundwater and surface water and sediment in Company Lake. Table 4-7 shows the results on this brick soil sample. The results for PCBs, VOCs, and TPH are not shown, but all were undetected (see Attachment D, Table D-1). For comparison, Table 4-7 also shows data for the historical dike samples; brick soil samples collected along the Columbia and Sandy Rivers; Company Lake sediment samples; and background samples for upland and wetland soils.

The dike brick soil samples had slightly higher concentrations of fluoride and some metals than the brick soil samples collected along the Columbia and Sandy Rivers or the background soil samples. Low PAH levels were detected (maximum total PAH concentration of 4.2 mg/kg) in the dike soil samples, whereas PAHs were not detected in the river brick soil samples. It appears that the dike brick may contribute low levels of fluoride, some metals, and PAHs to the underlying soil matrix.

In comparison, the brick soil samples showed significantly lower concentrations of fluoride and PAHs than did the Company Lake sediment samples. Metal values for the brick soil were lower (or at the low end of the detected concentrations) than metal values for the

Table 4-5
Process Residue Analytical Results for 1994

Analyte	Company Lake					Outfall Ditch
Sample ID	RM-SD10	RM-SD6	RM-SD7	RM-SD8	RM-SD9	RM-SD5
Station ID	RM-SD10	RM-SD6	RM-SD7	RM-SD8	RM-SD9	RM-SD5
Sample Date	8/19/94	8/19/94	8/19/94	8/19/94	8/19/94	8/19/94
Sample Depth (feet)	0.1	0.1	0.1	0.1	0.1	0.1
Inorganic Compounds (mg/kg)						
Cyanide, total	0.5 U	0.5 U	0.5 U	10	0.5 U	0.5 U
Fluoride (Method 340.2)	5800 RC	1600 RC	1800 RC	780 RC	1200 RC	1200 RC
Total organic carbon	130000 RC	210000 RC	180000 RC	87000 RC	240000 RC	28000 RC
Total Metals (mg/kg)						
Aluminum	48000 RC	26000 RC	33000 RC	63000 RC	44000 RC	25000
Antimony	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ
Arsenic	22 RC	18 RC	24 RC	50 RC	20 RC	6.2 RC
Barium	420 LRC	410 LRC	410 LRC	420 LRC	380 LRC	140 LRC
Beryllium	2.8	2.7	4.3	3.4	0.2 U	0.2 U
Cadmium	10	16	17	4	37	2.3
Calcium	120000 RC	110000 RC	130000 RC	58000 RC	84000 RC	22000
Chromium	23	32	40	78	28	19
Cobalt	17	10	15	38	16	13
Copper	170 RC	170 RC	190 RC	360 RC	220 RC	75
Iron	33000 RC	36000 RC	45000 RC	59000 RC	40000 RC	24000
Lead	79	170 RC	190 RC	74	300 RC	30
Magnesium	2000	2100	2400	3400 RC	2300	4700 RC
Manganese	4600 RC	1600 RC	2000 RC	3100 RC	1300 RC	410
Mercury	1.4	1.7	1.8	2.2	0.57	0.28
Nickel	150 RC	140 RC	180 RC	600 RC	150 RC	30
Potassium	1500 RC	1200 RC	1500 RC	2600 RC	1600 RC	1500 RC
Selenium	5.8 RC	6.4 RC	6.9 RC	3.4 L	5.8 RC	0.91 L
Silver	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Sodium	4400 RC	3700 RC	3800 RC	4600 RC	3500 RC	2000
Thallium	2 KRC	4.1 KRC	4.5 KRC	0.2 U	7 KRC	0.72 KRC
Vanadium	72 L	83 L	120 LRC	280 LRC	75 L	50 L
Zinc	520 LRC	420 LRC	410 LRC	240 LRC	680 LRC	160 LRC
PAHs (mg/kg)						
Acenaphthene	0.34 U	12 U	1.7 U	0.78	7.8 U	1.7 U
Acenaphthylene	0.34 U	12 U	1.7 U	0.067 U	7.8 U	1.7 U
Anthracene	15 JC	12 U	47 JC	3.2 JC	180 JC	1.7 U
Benzo(a)anthracene	270 RC	1700 RC	620 RC	43 RC	2400 RC	110 RC
Benzo(a)pyrene	220 RC	1800 RC	600 RC	40 RC	2400 RC	120 RC
Benzo(b)fluoranthene	550 RC	4600 RC	1400 RC	82 RC	5800 RC	250 RC
Benzo(g,h,i)perylene	210 RC	1200 RC	380 RC	27 RC	1500 RC	81 JC
Benzo(k)fluoranthene	210 RC	1100 RC	380 RC	24 RC	1500 RC	69 JC
Chrysene	620 RC	4400 RC	1400 RC	92 RC	5800 RC	260 RC
Dibenzo(a,h)anthracene	64 RC	360 JC	100 RC	7.6 RC	440 RC	22 JC
Fluoranthene	92 RC	540 JC	220 RC	27 RC	1100 RC	66 JC
Fluorene	0.34 U	12 U	1.7 U	0.067 U	7.8 U	1.7 U
Indeno(1,2,3-c,d)pyrene	210 RC	1100 RC	360 RC	28 RC	1500 RC	75 JC
Naphthalene	0.34 U	12 U	1.7 U	0.067 U	7.8 U	1.7 U
Phenanthrene	12 JC	12 U	1.7 U	4.3 RC	100 JC	1.7 U
Pyrene	100 RC	470 JC	200 RC	28 RC	820 RC	56 JC
PCBs (mg/kg)						
Aroclor 1016	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Aroclor 1221	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Aroclor 1232	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Aroclor 1242	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Aroclor 1248	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Aroclor 1254	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Aroclor 1260	2 RC	2 RC	3.5 RC	2.8 RC	2.8 RC	0.31 JC
TPH (mg/kg)						
Diesel/related	900	1300	1300	600	1700	550
Gasoline	2 U	2 U	2 U	2 U	2 U	2 U
Heavy oil/related	1200 RC	1500 RC	710 RC	620 RC	1300 RC	660 RC

Abbreviations:
J = estimated value
JC = result reported for higher dilutions; accuracy and precision are expected to be lower than for lower dilutions
K = estimated value; may be biased high on basis of spike recovery results
L = estimated value; may be biased low on basis of spike recovery results
RC = rejected; value outside calibration range
U = undetected

Table 4-6
Comparison Between 1996 and 1994 Process Residues

Analyte (mg/kg)	1996 Company Lake Process Residue[a] No. of Samples	No. of Detects	Minimum Detect	Maximum Detect	1994 Company Lake Process Residue[b] No. of Samples	No. of Detects	Minimum Detect	Maximum Detect
Cyanide, Total	15	9	1.3	7.9	6	1		10
Total Metals								
Aluminum	15	15	16100	74200	1	1		25000
Antimony	15	1		3.6	6	0		
Beryllium	15	15	0.85	3.39	6	4	2.7	4.3
Cadmium	15	14	0.76	8.44	6	6	2.3	37
Calcium	15	15	10100	70500	1	1		22000
Chromium	15	15	20.8	123	6	6	19	78
Cobalt	15	15	6.82	32.2	6	6	10	38
Copper	15	15	43.3	288	1	1		75
Iron	15	15	9500	26500	1	1		24000
Lead	15	15	23.8	114	3	3	30	79
Magnesium	15	15	1700	5920	4	4	2000	2400
Manganese	15	15	155	2220	1	1		410
Mercury	15	15	0.23	1.07	6	6	0.28	2.2
Nickel	15	15	42.5	790	1	1		30
Selenium	15	14	1.3	6.7	2	2	0.91	3.4
Silver	15	1		1.1	6	0		
Sodium	15	15	1260	6800	1	1		2000
Thallium	15	1		1.3	1	0		
Vanadium	15	15	62.2	271	4	4	50	83
PAHs								
Acenaphthene	15	2	0.17	0.98	6	1		0.78
Acenaphthylene	15	0			6	0		
Anthracene	15	15	0.064	26	6	4	3.2*	180*
Benzo(g,h,i)perylene	15	7	1.3	120	1	1		81*
Benzo(k)fluoranthene	15	15	0.25	150	1	1		69*
Dibenzo(a,h)anthracene	15	10	0.062	22	2	2	22*	360*
Fluoranthene	15	13	1	180	2	2	66*	540*
Fluorene	15	7	0.17	11	6	0		
Indeno(1,2,3-c,d)pyrene	15	13	1.4	93	1	1		75*
Naphthalene	15	0			6	0		
Phenanthrene	15	14	0.12	39	5	2	12*	100*
Pyrene	15	15	0.21	160	2	2	56*	470*
PCBs								
Aroclor 1016	15	0			6	0		
Aroclor 1221	15	0			6	0		
Aroclor 1232	15	0			6	0		
Aroclor 1242	15	0			6	0		
Aroclor 1248	15	4	0.42	2.1	6	0		
Aroclor 1254	15	0			6	0		
Aroclor 1260	15	0			1	1		0.31*
TPH								
Diesel by 8015	15	6	280	2200	6	6	550	1700

[a] Collected as integrated sample from 0- to 1-foot depth or 0- to 1.5-foot depth for core samples.

[b] Collected as surface grab from top 0.1 foot. Only analytes for which there are acceptable 1994 data are shown.

Symbol: * = result is qualified; result reported for higher dilutions; accuracy and precision expected to be lower than for lower dilutions

Table 4-7
Comparison of Company Lake Shoreline Brick Soil Samples with Other Brick Samples, Company Lake Sediments, and Background Values

Analyte (mg/kg)	Brick Soil Adjacent to Company Lake			Brick Soil along Columbia and Sandy Rivers				Company Lake Sediments		Background[b]			
Sample ID:	CL-SD004-0000-0	ND-1-S	ND-2-S	CR-SB007-0000-0	SR-SB001-0000-0	SR-SB002-0000-0	SR-SB003-0000-0						
Station ID:	CL-SD004	ND-1	ND-2	CR-SB007	SR-SB001	SR-SB002	SR-SB003						
Description	Dike Brick[a]	Dike Brick	Dike Brick	Columbia R. Brick	Sandy R. Brick	Sandy R. Brick	Sandy R. Brick	1996 Process Residue Data		Upland Soil		Wetland Soil	
Date Sampled:	10/16/96	8/4/94	8/4/94	9/5/96	9/6/96	9/6/96	9/6/96	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Cyanide, Total	1 U	0.1 U	0.1 U	1 U	1 U	1 U	1 U	1 U	7.9	1 U	2.6 U	1 U	3 U
Fluoride by 340.1/.2	420			340	270	270	350	7000	57000	180	240	120	250
Fluoride by 340.2M				4	2.5 U	2.5 U	11						
Fluoride By 300.0	9.3							3.5	170				
Carbon	4430			5920	5120	21100	30200	20100	185000	7950	58100	17400	26100
Total Metals													
Aluminum	19000 J			9500	10900	14500	9710	16100	74200	7270 J	10500	4720 J	14600
Antimony	2.5 UJ			2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	3.6	2.5 U	5.9 U	2.5 U	2.5 J
Arsenic	2.6			1.7	1.1	1.9	1.4	5.03	16.5	0.984	1.6	1.1	11.9
Barium	140			51.4	42.8	66.1	36.8	87.1	267	22.8	63	33.8	107
Beryllium	0.52			0.5 U	0.5 U	0.5 U	0.5 U	0.85	3.39	0.05 U	0.48 BJ	0.5 U	0.72
Cadmium	0.5 U			0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.44	0.41 U	0.05 U	0.47 U	0.77
Calcium	5600 (J)			3960	3670	4140	3810	10100	70500	2200	2860	2160	3740
Chromium	25.8			12.2	14.6	18.8	13.6	20.8	123	7.7	11.5	8.65	19.3
Cobalt	9.76			6.87	6.95	10.1	6.43	6.82	32.2	2.61	5.1 B	2.5 U	7.21
Copper	27.8			17.2	18.4	24.2	16.5	43.3	288	9.32	18.9 J	7.9 J	28.5
Iron	25900			13400	14100	19200	13400	9500	26500	8160	11800	6190	122000 D
Lead	10.2			5.8	5.4	8.1	6.2	23.8	114	5.4	25.9	0.71 J	28
Magnesium	5550			2620	2420	3390	2130	1700	5920	791	1590	924	3950
Manganese	239			166	147	276	158	155	2220	68.5	192 J	63.7	252
Mercury	0.2 U			0.2 U	0.2 U	0.2 U	0.2 U	0.23	1.07	0.2 U	0.08 J	0.09 UJ	0.2 U
Nickel	27.8			11.2	14.8	17.1	11.7	42.5	790	5.9	9.6 J	5.25	15.5
Potassium	1470			444	396	500	338	715	3350	240	422	266	1900
Selenium	1 U			1 U	1 U	1 U	1 U	1 U	6.7	0.32 UJ	1 U		1 U
Silver	1 U			1 U	1 U	1 U	1 U	1 U	1.5 U	0.33 U	1 U	0.37 U	1 U
Sodium	694			662	1010	648	642	1260	6800	363	670	262	647
Thallium	1 U			1 U	1 U	1 U	1 U	1 U	1.3 U	0.41 UJ	1 U	0.18 U	1 U
Vanadium	73.3			41.6	45.9	52.5	44.3	62.2	271	32.1	58.1	33	125
Zinc	62			34.2	33	47.1	32.8	73.9	1010	19.2	102	26.6	140
Total PAHs	1.3	0.2 U	4.2	0.33 U	0.33 U	0.33 U	0.33 U	3.6	1584	0.3 U	10 U	0.3 U	0.099 J

[a] Results for PCBs, VOCs, and TPH not shown; all were below detection limits (see Attachment D, Table D-1).

[b] From Technical Memorandum DS No. 12, *Background Data Summary for RMC-Troutdale* (CH2M HILL, November 22, 1996).

Abbreviations and Symbols:

J = estimated value

U = undetected

( ) = advisory flag based on professional judgment rather than method protocol

Company Lake sediment, with the exception of iron and magnesium. These results suggest that the bricks probably are not a significant source to sediments.

In RMC's AWARE (avoid waste and reduce emissions) program, tests have been conducted on "dirty" brick from the bakehouse to determine constituent concentrations that might leach or otherwise contribute constituents as they break down. "Dirty" bricks were collected from the inner flue walls, where were in contact with the baking anodes and were expected to have the highest accumulation of constituents because they came into contact with the pitch from the anode. A toxicity characteristic leaching procedure (TCLP) was conducted on the "dirty" brick. The TCLP method uses a relatively strong acid solution to measure leaching, and resulting TCLP concentrations would be higher than concentrations leaching from bricks exposed to normal rainwater. Additionally, this "dirty" brick was pulverized and standard soil methods were used to analyze constituents; this method provides an indication of the potential for constituent contributions if weathering of brick occurs (that is, if particulates erode from the brick). The AWARE results are shown in Table 4-8.

By the TCLP method, low levels of fluoride [1.2 milligrams per liter (mg/L)] and chromium (0.033 to 0.18 mg/L) were detected in the leachate from the bricks. Not all metals detected in brick soil were analyzed for in the "dirty" brick samples, but the results do indicate a low potential for contributing concentrations of the eight metals analyzed. No VOCs, except chloroform, were detected; the chloroform probably was an artifact of laboratory contamination.

By the soil method, most total metals were not detected in the "dirty" brick. The only detected metals were arsenic (1 mg/kg), chromium (16 mg/kg), copper (9 mg/kg), and zinc (3 mg/kg). Again, not all metals were analyzed for, but these results indicate that the bricks could contribute low levels of metals. PAHs were detected in one of the two samples at a concentration of 7.7 mg/kg. This concentration is comparable to the PAH concentrations found in the dike brick soil samples.

In summary, leaching or particulate contribution from the brick along the COE dike appears to be an insignificant source to Company Lake sediment or interstitial soil. Additionally, the interstitial soil beneath the brick is inaccessible to direct-contact exposure. Leaching to groundwater is also a potential pathway. PAHs are relatively insoluble and are not expected to leach. Fluoride and metals may leach to groundwater, but the concentrations are expected to be insignificant in comparison to the potential leaching from Company Lake sediment.

4.5.3 Soil Sample in Depression East of Outfall Ditch

One surface soil sample (CL-SD002-000-0) was collected in a depression east of the outfall ditch, where overflow of the outfall ditch was observed during flooding. The purpose of this sample is to determine whether constituents in the outfall ditch have affected soil concentrations in the depression. Table 4-9 compares the depression soil sample results with background concentrations for upland and wetland soils. The results indicate that overflow from the outfall ditch has probably contributed low concentrations of constituents to this depression area. Fluoride and metal concentrations in the depression soil are slightly

Table 4-8
Analytical Results of Flue Brick Collected as Part of RMC's AWARE Program

Sample Date	9/6/90	8/9/95	2/28/96	11/1/96
Analyte				
TCLP Method (mg/L)				
Fluoride (340.2)			1.2	
Metals				
Arsenic	0.25 U	0.1 U		
Barium	0.23	0.5 U		
Cadmium	0.0054 U	0.01 U		
Chromium	0.033	0.18		
Lead	0.055 U	0.05 U		
Mercury	0.0002 U	0.001 U		
Selenium	0.005 U	0.1 U		
Silver	0.011 U	0.01 U		
VOCs				
Benzene	0.0053 U	0.2 U		
Carbon tetrachloride	0.005 U	0.2 U		
Chlorobenzene	0.0047 U	0.2 U		
Chloroform	0.031	0.2 U		
1,4-Dichlorobenzene	0.005 U	0.2 U		
1,2-Dichlorobenzene		0.2 U		
1,1-Dichlorobenzene	0.005 U	0.2 U		
Methyl ethyl ketone	0.099 U	5 U		
Tetrachloroethene	0.005 U	0.2 U		
Trichloroethene	0.005 U	0.2 U		
Vinyl Chloride	0.0099 U	0.1 U		
Soil Method (mg/kg)				
Fluoride (300.0)			15	
Metals				
Antimony				10 U
Arsenic				1
Beryllium				1 U
Cadmium				1 U
Chromium				16
Copper				9
Lead				20 U
Mercury				0.2 U
Nickel				10 U
Selenium				1 U
Silver				2 U
Thallium				1 U
Zinc				3
PAHs				
Acenaphthene		1 U	0.3 U	
Acenaphthylene		1 U	0.3 U	
Anthracene		0.1 U	0.3 U	
Benzo(a)anthracene		0.8	0.3 U	
Benzo(a)pyrene		1	0.3 U	
Benzo(b)fluoranthene		1.1	0.3 U	
Benzo(g,h,i)perylene		0.5	0.3 U	
Benzo(k)fluoranthene		0.5	0.3 U	
Chrysene		0.7	0.3 U	
Dibenzo(a,h)anthracene		0.1 U	0.3 U	
Fluoranthene		1.2	0.3 U	
Fluorene		0.2 U	0.3 U	
Indeno(1,2,3-cd)pyrene		0.4	0.3 U	
Naphthalene		1 U	0.3 U	
Phenanthrene		0.4	0.3 U	
Pyrene		1.1	0.3 U	

Abbreviation: U = undetected

Table 4-9
Soil Sample from Depression East of Outfall Ditch

Sample ID:	CL-SD002-0000-0[a]	Background[b]			
Station ID:	CL-SD002				
Date Sampled:	10/15/96	Upland Soil		Wetland Soil	
Depth (feet)	0 to 1.5	Minimum	Maximum	Minimum	Maximum
Analyte (mg/kg)					
Cyanide, Total	1 U	1 U	2.6 U	1 U	3 U
Fluoride by 340.1/.2	570	180	240	120	250
Fluoride By 300.0	20				
Total Organic Carbon	10500	7950	58100	17400	26100
Total Metals					
Aluminum	25800 J	7270 J	10500	4720 J	14600
Antimony	2.5 UJ	2.5 U	5.9 U	2.5 U	2.5 J
Arsenic	10.1	0.984	1.6	1.1	11.9
Barium	152	22.8	63	33.8	107
Beryllium	0.78	0.05 U	0.48 BJ	0.5 U	0.72
Cadmium	1.17	0.41 U	0.05 U	0.47 U	0.77
Calcium	6440 (J)	2200	2860	2160	3740
Chromium	30.2	7.7	11.5	8.65	19.3
Cobalt	12	2.61	5.1 B	2.5 U	7.21
Copper	46.3	9.32	18.9 J	7.9 J	28.5
Iron	32300	8160	11800	6190	122000 D
Lead	37.8	5.4	25.9	0.71 J	28
Magnesium	6120	791	1590	924	3950
Manganese	473	68.5	192 J	63.7	252
Mercury	0.2 U	0.2 U	0.08 J	0.09 UJ	0.2 U
Nickel	25.8	5.9	9.6 J	5.25	15.5
Potassium	2200	240	422	266	1900
Selenium	1 U	0.32 UJ	1 U		1 U
Silver	1 U	0.33 U	1 U	0.37 U	1 U
Sodium	939	363	670	262	647
Thallium	1 U	0.41 UJ	1 U	0.18 U	1 U
Vanadium	71.9	32.1	58.1	33	125
Zinc	173	19.2	102	26.6	140
PAHs					
2-Methylnaphthalene	0.49 U				
Acenaphthene	0.49 U	0.3 U	10 U	0.3 U	0.39 U
Acenaphthylene	0.49 U	0.3 U	10 U	0.3 U	0.39 U
Anthracene	0.49 U	0.3 U	10 U	0.3 U	0.39 U
Benzo(a)anthracene	0.12 J	0.3 U	10 U	0.3 U	0.027 J
Benzo(a)pyrene	0.13 J	0.3 U	10 U	0.3 U	0.39 U
Benzo(b)fluoranthene	0.39 J	0.3 U	10 U	0.3 U	0.39 U
Benzo(g,h,i)perylene	0.16 J	0.3 U	10 U	0.3 U	0.39 U
Benzo(k)fluoranthene	0.26 J	0.3 U	10 U	0.036 U	0.3 U
Chrysene	0.29 J	0.3 U	10 U	0.035 U	0.3 U
Dibenzo(a,h)anthracene	0.49 U	0.3 U	10 U	0.3 U	0.39 U
Fluoranthene	0.12 J	0.3 U	10 U	0.3 U	0.031 J
Fluorene	0.49 U	0.3 U	10 U	0.3 U	0.39 U
Indeno(1,2,3-cd)pyrene	0.14 J	0.3 U	10 U	0.3 U	0.39 U
Naphthalene	0.01 U	0.3 U	10 U	0.3 U	0.39 U
Phenanthrene	0.49 U	0.3 U	10 U	0.3 U	0.39 U
Pyrene	0.11 J	0.3 U	10 U	0.3 U	0.041 J

[a] Results for PCBs, VOCs, and TPH not shown; all were below detection limits (see Attachment D, Table D-1).

[b] From Technical Memorandum DS No. 12, *Background Data Summary for RMC-Troutdale* (CH2M HILL, November 22, 1996).

Abbreviations and Symbols:

B = below reporting limit and above instrument detection limit.

D = compound run at a dilution to bring the concentration of that compound within the linear range of the instrument

J = estimated value

P = greater than 25% difference for detected concentrations between the two columns used for analysis

U = undetected

( ) = advisory flag based on professional judgement rather than method protocol

above background values. Total PAHs were detected in the depression soil at a concentration of 1.7 mg/kg; the background soil values ranged from below detection limits to 0.1 mg/kg.

4.5.4 West Company Lake Soil

Five soil samples from three locations in West Company Lake were analyzed for the suite of constituents. Samples CL-SD038-0120-0, CL-SD039-0075-0, and CL-SD040-0235-0 were collected at depths where a potential process residue layer was visually identified. Sample CL-SD040-0235-0 showed no visual indication of process residue, but was collected at the approximate depth where the layer might have existed in the past, on the basis of observation of the samples. Samples CL-SD038-0150-0 and CL-SD039-0120-0 were collected below the process residue layer, in what appeared to be native sediment. A summary of analytical results is presented Table 4-10, and these results are discussed below. All the data are provided in Attachment D, Table D-3.

Cyanide. Total cyanide was detected in the process residue sample from Station CL-SD038 (7.7 mg/kg). No cyanide was detected in any other samples.

Fluoride. Fluoride by EPA Method 340.1/340.2 was detected in all samples, with the highest concentration (8,200 mg/kg) in the process residue sample from Station CL-SD038. Fluoride by Method 300.0 was detected in all samples except the sample from Station CL-SD040. The highest concentration (360 mg/kg) by this method appeared in the process residue sample from Station CL-SD038.

Total Metals. Total metal concentrations were generally higher in process residue from Station CL-SD038 than in other samples.

PAHs. Nine PAHs were detected in the process residue layer at Station CL-SD038, with a total PAH concentration of 7.59 mg/kg. No PAHs were detected in any other samples.

PCBs. Aroclor 1268 was detected at a concentration of 0.34 mg/kg in the process residue sample from Station CL-SD038. No PCBs were detected in any other samples.

TPH. Petroleum hydrocarbons were not detected in any of the samples.

VOCs. VOCs were not detected in any of the samples.

The native soils underneath the potential process layer appeared to be unaffected; no cyanide, PAHs, PCBs, TPH, or VOCs were detected, and concentrations of metals and fluoride were similar to background concentrations. Of the potential process residue samples, CL-SD038 appeared to have higher concentrations of most constituents. These CL-SD038 concentrations were at the low end, or were lower than the concentrations detected in Company Lake sediment. This finding is consistent with the belief that the primary source of higher-constituent-concentration sediment in Company Lake is solids from the air treatment system, which were discharged into Company Lake from 1975 to 1989. Because West Company Lake was filled in 1970, these higher-concentration sediments would not be present in that area. Of the three soil borings, only one showed evidence of elevated fluoride and low-level detections of PAHs and PCBs. Either the historical deposition of process residue in West Company Lake was heterogeneous in distribution or the residue was disturbed during fill activities by GS&G.

Table 4-10
Analytical Results for Soil Samples at West Company Lake

Sample ID:	CL-SD038-0120-0	CL-SD038-0150-0	CL-SD039-0075-0	CL-SD039-0120-0	CL-SD040-0235-0
Station ID:	CL-SD038	CL-SD038	CL-SD039	CL-SD039	CL-SD040
Date Sampled:	11/26/96	11/26/96	11/26/96	11/26/96	11/27/96
Depth (ft):	12-13	15-16	7.5-9	12-13	23.5-25
Description:	Potential Process Residue	Native Sediment	Potential Process Residue	Native Sediment	Potential Process Residue
Analyte (mg/kg)*					
Cyanide, Total	7.7	1 U	1 U	1 U	1 U
Fluoride By 340.1/.2	8200 (J)	270 (J)	370 (J)	190 (J)	370 (J)
Fluoride By 300.0	360 D	5	21	9	2.5 U
Total Organic Carbon	41300	6070	12100	577	1500
Total Metals					
Aluminum	21500 J	6820 J	12000 J	5890 J	4810 J
Antimony	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Arsenic	4.7	1.4	3.8	1.2	0.58
Barium	116	28.6	85.4	26.6	33.4
Beryllium	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Cadmium	0.5	0.5 U	0.5 U	0.5 U	0.5 U
Calcium	11100	3340	4380	3100	2510
Chromium	49.8	10.3	16	12	8.32
Cobalt	12.6	4.19	7.49	4.24	3.56
Copper	66.3	11.9	22.9	11.7	9.13
Iron	18700 J	10600 J	16700 J	11100 J	8370 J
Lead	21.4	5 U	14.2	5 U	5 U
Magnesium	3760	1440	3060	1310	1390
Manganese	194	97	232	91.1	73.6
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	173	7.78	39	11.8	6.69
Potassium	1390	278	986	222	271
Selenium	1 U	1 U	1 U	1 U	1 U
Silver	1 U	1 U	1 U	1 U	1 U
Sodium	1630	719	685	613	454
Thallium	1 U	1 U	1 U	1 U	1 U
Vanadium	114	38.7	50.8	45	29.5
Zinc	90.3	24.4	76.7	22.5	24.5
PAHs					
2-Methylnaphthalene	0.52 U	0.52 U	0.43 U	0.43 U	0.43 U
Acenaphthene	0.52 U	0.52 U	0.43 U	0.43 U	0.43 U
Acenaphthylene	0.52 U	0.52 U	0.43 U	0.43 U	0.43 U
Anthracene	0.52 U	0.52 U	0.43 U	0.43 U	0.43 U
Benzo(a)anthracene	0.78	0.52 U	0.43 U	0.43 U	0.43 U
Benzo(a)pyrene	0.43 J	0.52 U	0.43 U	0.43 U	0.43 U
Benzo(b)fluoranthene	0.6	0.52 U	0.43 U	0.43 U	0.43 U
Benzo(g,h,i)perylene	0.32 J	0.52 U	0.43 U	0.43 U	0.43 U
Benzo(k)fluoranthene	0.41 J	0.52 U	0.43 U	0.43 U	0.43 U
Chrysene	2.1	0.52 U	0.43 U	0.43 U	0.43 U
Dibenzo(a,h)anthracene	0.52 U	0.52 U	0.43 U	0.43 U	0.43 U
Fluoranthene	1.8	0.52 U	0.43 U	0.43 U	0.43 U
Fluorene	0.52 U	0.52 U	0.43 U	0.43 U	0.43 U
Indeno(1,2,3-cd)pyrene	0.52 U	0.52 U	0.43 U	0.43 U	0.43 U
Naphthalene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Phenanthrene	0.21 J	0.52 U	0.43 U	0.43 U	0.43 U
Pyrene	0.94	0.52 U	0.43 U	0.43 U	0.43 U
Total PAH (sum of above)	7.59	U	U	U	U
PCBs					
Aroclor 1016	0.052 U	0.052 U	0.043 U	0.043 U	0.043 U
Aroclor 1221	0.1 U	0.1 U	0.088 U	0.088 U	0.088 U
Aroclor 1232	0.052 U	0.052 U	0.043 U	0.043 U	0.043 U
Aroclor 1242	0.052 U	0.052 U	0.043 U	0.043 U	0.043 U
Aroclor 1248	0.052 U	0.052 U	0.043 U	0.043 U	0.043 U
Aroclor 1254	0.052 U	0.052 U	0.043 U	0.043 U	0.043 U
Aroclor 1260	0.052 U	0.052 U	0.043 U	0.043 U	0.043 U
Aroclor 1262	0.052 U	0.052 U	0.043 U	0.043 U	0.043 U
Aroclor 1268	0.34 P	0.052 U	0.043 U	0.043 U	0.043 U
TPH					
TPH (HCID)	U	U	U	U	U

* VOCs were analyzed but not detected (see Attachment D, Table D2).

Abbreviations and Symbols:

D = compound run at a dilution to bring the concentration of that compound within the linear range of the instrument

HCID = hydrocarbon identification

J = estimated value

P = greater than 25% difference for detected concentrations between the two columns used for analysis

U = undetected

( ) = advisory flag based on professional judgment rather than method protocol

4.6 Dike Construction Historical Review

A historical review of the COE dike construction was performed to provide information that might be needed during remedial design, should remediation (such as dredging or cap construction) of Company Lake be necessary.

RMC's Troutdale facility and the Troutdale Airport are located within the Sandy Drainage District. COE constructed the section of the Columbia River dike that borders the Sandy Drainage District in three different phases. The dike length within the drainage district is approximately 17,300 feet. It extends from near the intersection of Interstate I-84 and the Sandy River at the east end to the boundary between the Multnomah and Sandy Drainage Districts at the west end (just west of Fairview Farms). The dike was designed to have a minimum top width of 12 feet. The designed upstream elevation of the top of the dike is 45 feet above mean sea level (MSL), and the design downstream elevation is 44 feet above MSL (46.35 and 45.35 feet NGVD, respectively). According to a 1953 COE report (COE, December 30, 1953), the 100-year flood would produce a maximum water-surface elevation of 42.2 feet above MSL (43.55 feet NGVD) on the Columbia River in the vicinity of the dike.

The three construction phases of the COE dike are described below.

4.6.1 Original Dike Construction

A major portion of the Columbia River dike in the Sandy Drainage District was originally constructed in 1915. At that time, the dike was constructed to about the height of the 1876 flood (approximately 39 feet above MSL). In the 1953 COE report, cross sections of the original dike show the dimensions and features of the dike to be very inconsistent. On the basis of these cross sections, the 1915 dike either was not constructed to any given dimensions or was changed drastically between the time it was built and the time of the survey.

From conversations with COE personnel (Jay Stergile/COE, December 2, 1996), it is unlikely that the original dike was constructed with any specifications for lift thickness or any compaction requirements. COE personnel indicated that dike construction before the 1930s to 1940s was typically performed with horse-drawn scrapers, and that the only compaction was typically that achieved as a side effect of hauling traffic.

4.6.2 Dike Improvements, 1940 to 1941

Improvements to the dike were authorized by the Flood Control Act of 1936 and were carried out in 1940 and 1941. The improvements made in 1940 and 1941 consisted of reconstructing about 2.4 miles of the dike, constructing about 1.2 miles of new dike, and constructing facilities to pass flows from the interior of the drainage system through the dike (COE, December 30, 1953).

Improvements made to the dike in 1940 and 1941 resulted in a levee with a top width of 12 feet, side slopes of 2.5H:1V (horizontal:vertical), and a top elevation ranging from 44 feet above MSL (at the downstream end) to 45 feet above MSL (at the upstream end). Analysis of soil borings advanced along the dike after the 1940-1941 improvements and before the 1953-1954 improvements indicated that the dike was constructed with a combination of alluvial sands, silts, and clays that probably came from adjacent borrow areas. The locations of the borrow areas are unknown.

4.6.3 Dike Improvements, 1953 to 1954

Additional improvements to the dike were authorized by the 1950 Flood Control Act. In its 1953 report, COE concluded that the existing dike had "ample elevation to prevent overflow during the design flood, but required improvements... to insure safety against seepage and possible failure" (COE, December 30, 1953). The improvements authorized in 1950 were made in 1953 and 1954. In addition to dike improvements, the construction of an approximately 5,000-foot-long cross dike was also authorized. The cross dike was constructed to the same elevation as the main dike and was located to separate the Sandy Drainage District from Multnomah County Drainage District 1.

The logs from soil borings advanced before 1953 indicated stratification of foundation and dike materials. This stratification is believed to have permitted excessive seepage during high river stages. During the 1948 flood, a number of areas behind the dike in the Sandy Drainage District were observed to seep excessively, and several of these areas required constant attention to prevent or contain boils and prevent seepage failure of the levee slope. Notes taken during the 1948 flood event indicated that extensive seepage and boiling occurred along the dike in the area from approximately 400 feet east of Company Lake to approximately 2,000 feet east of Company Lake. Subsurface explorations in these areas by COE verified the existence of sand layers with permeability factors ranging from 0.009 to 0.05 centimeter per second (cm/second).

Recommendations contained in the 1953 COE report include increasing the levee section on the land side by placing additional pervious material with flattened slopes and installing interior drains at critical seepage areas. The additional material was specified to be river sand or gravel, with a 5H:1V backslope from elevation 40 feet above MSL (41.35 feet NGVD). Additional pervious materials along the landward side of the dike were placed to provide extended seepage paths and reduce seepage pressures during floods.

The 1953 COE report also recommended placing lateral toe drains on 250-foot spacings on the landward side of the dike, from approximately 400 to 2,000 feet east of Company Lake.

Implementation of the improvements to the existing dike that were recommended in the 1953 COE report was begun in 1953 and completed in 1954; however, records of construction procedures are unavailable.

4.7 Evaluation of Potential Flood Impacts

If remedial actions are required in Company Lake, some alternatives such as capping might be affected by flooding when the water level elevations in the Columbia and Sandy River are high. This section evaluates available Columbia River stage data and modeling results to predict flood velocities that might occur in the Company Lake area under extreme flood conditions. This information might be needed during remedial design.

On a fairly regular basis during the rainy season, precipitation and snow melt temporarily elevate water levels in the Columbia River. If the river elevation is higher than the level in Company Lake, reverse flow occurs in the outfall ditch until the two water bodies are equalized. However, velocities in the outfall ditch during this equalization are low and the pond remains quiescent during the elevated period. Velocities sufficient to affect a cap in Company Lake are not likely during typical high water events in the Columbia River (that is, when there is flow reversal in the outfall ditch). Therefore, this evaluation focuses on

extreme flood events, in which overland flow from the Columbia and Sandy Rivers might affect remedial design.

4.7.1 Columbia River Stage Data

The GS&G facility is located immediately west of Company Lake. CH2M HILL installed a river stage gauge on the GS&G loading dock in July 1994. Data from the gauge for July 1994 through September 1996 are generally available; however, there are periods of varying extent for which data are not available. The available data show the Columbia River to range on average between 4 and 12 feet above MSL. During the flood of February 1996, CH2M HILL's onsite personnel visually observed a maximum flood stage of 30.15 feet on February 9 (the gauge was not operational during this period).

The closest U.S. Geological Survey (USGS) Columbia River gauge that measures daily stage data is located immediately below Bonneville Dam. This gauge (ID 14128870) was found to be too far from the site to be useful.

4.7.2 U.S. Army Corps of Engineers Water Surface Profile (HEC-2) Modeling

COE has modeled reaches along the Columbia River by using the HEC-2 Water Surface Profiles model. This model, developed and maintained by the Hydrologic Engineering Center, predicts water surface elevations that correspond to peak flows of varying recurrence intervals.

COE modeled the reach from the Willamette River to the Washougal River in 1991. Company Lake is located between Cross Sections 119.88 and 121.34, approximately at River Mile 120.2. Model results of interest include channel water surface elevations and velocities. Table 4-11 presents the water surface elevations for the model cross sections (River Miles 119.88 and 121.34) enveloping Company Lake and an interpolation for the lake at River Mile 120.2.

Table 4-11
COE HEC-2 Water Surface Elevations by Flood Recurrence Interval
(Feet Above Mean Sea Level)

River Mile Cross Section	2-Year	10-Year	50-Year	100-Year	500-Year
119.88[a]	21.02	26.06	29.63	31.13	34.60
120.2[b]	**21.11**	**26.17**	**29.75**	**31.25**	**34.71**
121.34[a]	21.45	26.57	30.16	31.66	35.11

[a] COE HEC-2 modeling results.
[b] Interpolation of COE HEC-2 modeling results for Company Lake area.

On the basis of the COE HEC-2 model results, the flood-stage event of February 1996 (30.15 feet) was between a 50- and a 100-year event.

For the Columbia River or Sandy River to encroach onto the Company Lake area (other than by backflow through the outfall ditch), the river stage must exceed 23.65 feet. This is

the low point of the outfall road that forms a barrier against the rivers. According to the HEC-2 hydraulic modeling results, the Columbia River has a probability of reaching this stage on average once every 6 years (or a 16 percent chance of occurring in any given year).

4.7.3 Flood Velocities

The COE HEC-2 model predicts that the velocities shown in Table 4-12 will occur in the left overbank of Cross Section 119.88, which bisects the GS&G property.

Table 4-12
COE HEC-2 Left Overbank Velocities by Flood Recurrence Interval
(Feet per Second)

Cross Section	2-Year	10-Year	50-Year	100-Year	500-Year
119.88	0.21	0.73	1.01	1.11	1.28

The COE HEC-2 model uses a Manning's N (roughness coefficient) value of 0.06 in the left overbank. However, the Company Lake area is approximately two-thirds light forest and warrants a higher Manning's N value, which would result in lower velocities. In addition, the model assumes unconstrained overbank flow in the longitudinal direction (parallel to river). The GS&G facility to the west of Company Lake is situated on fill material at an elevation between 30 and 40 feet. This fill forms a barrier to flow in the longitudinal direction that would further impede velocities in the vicinity of Company Lake.

The likely scenario for flooding is that the Columbia River first would flow into Company Lake via the outfall ditch and a pool of water would begin to form in the Company Lake area. As the Columbia River rose further, it would breach the outfall road bounding Company Lake. As the river continued to rise, flow would begin to occur in a northwesterly direction from the Sandy River toward Company Lake and would exit the area generally from the location of the outfall ditch. Flow velocities probably would be less than 1 foot per second (fps), even in a 500-year event. This flow velocity (less than 1.0 fps) is reasonable given the following characteristics:

- The relatively dense vegetation on the area in the vicinity of Company Lake
- The depth of Company Lake itself
- The restrictive/pool characteristic of the inundation area

The dense vegetation provides resistance to flow passing through the inundation area adjacent to Company Lake, and thereby contributes to reduced velocities. The equation of velocity distribution indicates that under turbulent conditions, the bottom velocity in a shallow canal is larger than that in a deeper canal when the mean velocity is the same. Because scouring is caused primarily by the bottom velocity, the maximum permissible (nonscouring) velocity increases with depth of flow. Therefore, the main treatment pond area is acting as a deep channel, with less tendency for scouring of the bottom sediments. Finally, the GS&G property west of Company Lake provides a barrier perpendicular to the direction of flow during an inundation. This barrier will mitigate flow (similar to backwater behind a dam) and contribute to reduced velocities.

5 Summary of Findings

A brief summary of the results is provided below to help improve the conceptual model of the Company Lake area.

- **Survey of Physical Features**
  - The bathymetry is consistent with the previous conceptual model: the shallower western portion has a gently sloping bottom, and the deeper eastern portion has steeper bottom slopes.
  - The brick along the dike shoreline is located primarily along the eastern portion of the south shore.
- **Aquatic Plant Survey**
  - There are densely rooted aquatic plants in shallow areas (less than 6 feet of water) of the pond.
  - The dominant species are waterweed, curly-leaved pondweed, and eelgrass pondweed.
- **Company Lake Sediment**
  - Company Lake sediment is composed of process residue and an underlying native sediment:
    - The process residue has a consistency of very wet elastic silt throughout its vertical profile and typically exhibits a slight sheen.
    - The native sediment is composed of silt or sandy silt.
  - The process residue thickness varies from 0.1 to 2.5 feet; the thickest accumulations occur in the western shallow portion (near the existing South Ditch inlet) and in the deeper eastern portion.
  - Constituents detected in the process residue are consistent with permitted waste streams. The process residue contains elevated concentrations of fluoride, metals, PAHs, and TPH. Relatively low concentrations of cyanide and PCBs have been detected in some process residue samples. No VOCs have been detected in any samples.
  - Concentrations of constituents detected in the underlying sediment suggest that the native sediment is relatively unaffected by constituents in the process residue or process wastewater, except for fluoride. No cyanide, PCBs, TPH, or VOCs have been detected, and only low concentrations of PAH have been detected in native sediment. Metal concentrations in native sediment are similar to background concentrations.
- **Dike Brick Soil**

  The brick along the COE dike appears to be an insignificant source to Company Lake sediment and surface water, or to groundwater:

- Results of analysis of soil samples collected within the brick along the dike have suggested that the brick may contribute low levels of fluoride, metals, and PAHs to interstitial soil, but these concentrations are significantly lower than concentrations found in Company Lake sediment.
- Concentrations in "dirty" brick directly from the bakehouse are similar to concentrations in brick soil and much lower than concentrations in Company Lake sediment, an indication that the bricks have not been a major contributor of constituents to Company Lake sediment or groundwater.

- **Soil in Depression East of Outfall Ditch**
  - Overflow from the outfall ditch into the depression east of the ditch during flooding probably has contributed low levels of constituents, including fluoride, metals, and PAHs, to the surface soil.
  - No cyanide, PCBs, TPH, or VOCs have been detected in the depression soil.
- **West Company Lake**
  - Results of borings through West Company Lake indicate that the existing fill material is 8 to 24 feet deep.
  - Below this fill, a potential layer of process residue, 6 to 12 inches thick, has been noted in several borings, although the layer does not appear to be composed entirely of process residue, as observed in Company Lake.
  - Concentrations detected in the West Company Lake process residue (which was deposited from 1947 to 1970) are lower than those detected in the Company Lake sediment and are consistent with the belief that the primary source of constituents in Company Lake has been bleed streams from the carbon plant (bakehouse) air emission control system. These bleed streams were discharged from 1975 to 1989.
  - The historical deposition of process residue in West Company Lake either was heterogeneously distributed or was disturbed during initial fill activities by GS&G.
- **Dike Construction Historical Review**

  The COE dike between the RMC facility and the Columbia and Sandy Rivers was constructed in three phases:
  - Original construction was in 1915, to approximately 39 feet above MSL.
  - In 1940 and 1941, dike improvements increased the top width, standardized the side slopes, and raised the top elevation to between 44 and 45 feet above MSL.
  - In 1953 and 1954, additional dike improvements were made. These included placement of pervious material on the dike to an elevation of 40 feet above MSL and placement of toe drains to reduce seepage pressure during flooding and increase the overall dike stability.

- **Evaluation of Potential Flood Impacts**
  - Results of an evaluation of flood velocities in the Company Lake area indicate that the outfall road forms a barrier during low flood periods up to an elevation of 23.65 feet above MSL.
  - Flood velocities tend to be reduced because of the existing topography and vegetation surrounding Company Lake.
  - Flood velocities are predicted to be less than 1 fps, even during a 500-year event.

6 References

CH2M HILL. *Draft Current Situation Summary*. Prepared for Reynolds Metals Company, Troutdale, Oregon. April 5, 1996.

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U.S. Army Corps of Engineers. *Design Memorandum, Sandy Drainage District, Lower Columbia River Improvement to Existing Works, Oregon and Washington*. Prepared by the Department of the Army, Portland District, Corps of Engineers. Portland, Oregon. December 30, 1953.

ATTACHMENT A

Sediment Coring and Boring Logs

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD001

Sheet 1 of 1

Sampling Contractor CH2M HILL

Sampling Method AMS Soft Sediment Sampler

Collection Date 10/15/96

Sample Elevation (ft, NGVD) 12.6

Approximate Water Depth (ft) 2.6

Sample Collector(s) R. Johns, J. Tielens

Sample Logger R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Silt, (ML), dark gray, clayey, very soft, organic-rich, possibly process residue		Sample CL-SD001-0000-0
2.0			• Total drive = 3' • Total core recovered = 1.2'
3.0			
4.0			
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 1 SC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG
Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD002
Sheet 1 of 1

Sampling Contractor CH2M HILL
Sampling Method AMS Soft Sediment Sampler
Collection Date 10/15/96
Sample Elevation (ft, NGVD) 9.8
Approximate Water Depth (ft) NONE
Sample Collector(s) R. Johns, J. Tielens
Sample Logger R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Silt, (ML), medium brown, firm		Sample CL-SD002-0000-0
2.0			• Total drive = 3.5' • Total core recovered = 2'
3.0			
4.0			
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11/96 LC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD003

Sheet 1 of 1

Sampling Contractor CH2M HILL

Sampling Method AMS Soft Sediment Sampler

Collection Date 10/15/96

Sample Elevation (ft, NGVD) 13.2

Approximate Water Depth (ft) 2.1

Sample Collector(s) R. Johns, J. Tielens

Sample Logger R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
	Process residue, dark gray, clayey, soft, organic-rich, slight odor and sheen		Sample CL-SD003-0000-0
1.0			• Total drive = 2.5'
			• Total core recovered = 1'
2.0			
3.0			
4.0			
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD004

Sheet 1 of 1

Sampling Contractor: CH2M HILL

Sampling Method: Shovel

Collection Date: 10/16/96

Sample Elevation (ft, NGVD): 15.3

Approximate Water Depth (ft): NONE

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
	0-0.5' : Brick		
1.0	Silt, (ML), medium brown, firm, some fine sand		Sample CL-SD004-0000-0
2.0			
3.0			
4.0			
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11/96 LC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD005

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/19/96

Sample Elevation (ft, NGVD): 13.6

Approximate Water Depth (ft): 1.6

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 0.5' : Process residue/organic matter, black, slight sheen; small (1/16") metallic pieces in sample		Sample CL-SD005-0000-0
2.0	Bottom: Silt, (ML), gray, some fine-grained sand, some clay, slightly moist, firm		Sample CL-SD005-0010-0
3.0			
4.0			• Total drive = 4' • Total core recovered = 3.2'
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

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CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD006

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/19/96

Sample Elevation (ft, NGVD): 10.3

Approximate Water Depth (ft): 4.9

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 2' : Organic matter/process residue (?), black, silty, wet, very soft, slight sheen		Sample CL-SD006-0000-0
2.0	2'– 4' : Silt with sand, (ML), brown, slightly moist, medium-grained sand		
3.0	3.3'–3.6' : Poorly graded sand, (SP), medium-grained, brown, medium dense		Sample CL-SD006-0020-0
4.0			• Total drive = 5' • Total core recovered = 4'
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11/96 LC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD007

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/19/96

Sample Elevation (ft, NGVD): 3.2

Approximate Water Depth (ft): 12.0

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 1' : Organic matter/process residue (?), black, clayey, very soft, odor, sheen 1'– 1.1' : Poorly graded sand, (SP), medium gray, medium grained		Sample CL-SD007-0000-0
2.0	Silt with sand, (ML), light/medium greenish gray, slightly moist, fine to medium-grained sand		Sample CL-SD007-0015-0
3.0			
4.0			
5.0			• Total drive = 5' • Total core recovered = 4.5'
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

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CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD008

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/19/96

Sample Elevation (ft, NGVD): 7.5

Approximate Water Depth (ft): 7.7

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 0.1' : Process residue/organic matter, black, very wet Silt, (ML), gray, slightly moist, firm, trace fine-grained sand		No top sample taken Sample CL-SD008-0010-0
2.0			
3.0			
4.0			
5.0			• Total drive = 5' • Total core recovered = 4.5'
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11/96 LC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD009

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/19/96

Sample Elevation (ft, NGVD): 3.1

Approximate Water Depth (ft): 12.1

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 1.1' : Process residue/organic matter, black, silty, very soft, slight odor, slight sheen		Sample CL-SD009-0000-0
2.0	Silt with sand, (ML), gray/greenish gray, slightly moist, firm		Sample CL-SD009-0020-0
3.0			
4.0			• Total drive = 5' • Total core recovered = 4'
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

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CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD010

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/19/96

Sample Elevation (ft, NGVD): 0.91

Approximate Water Depth (ft): 14.3

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 2' : Process residue/organic matter, silty, black, very soft, odor, sheen		Sample CL-SD010-0000-0
2.0			
3.0	Poorly graded sand,(SP), brown, medium grained		
4.0	Silt, (ML), somewhat sandy, gray, slightly moist, firm		Sample CL-SD010-0030-0
5.0			• Total drive = 5' • Total core recovered = 4.5'
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

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CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD011

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

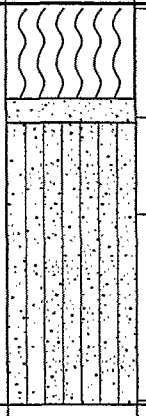
Collection Date: 10/19/96

Sample Elevation (ft, NGVD): 12.1

Approximate Water Depth (ft): 3.2

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 1' : Process residue/organic matter, black, silty, very soft 1'-1.1' : Poorly graded sand, (SP), brown, medium dense, medium-grained sand		Sample CL-SD011-0000-0
2.0			
3.0	Sandy silt, (ML), brown, fine-grained sand, firm		Sample CL-SD011-0020-0
4.0			• Total drive = 5' • Total core recovered = 4'
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD012

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/19/96

Sample Elevation (ft, NGVD): 11.5

Approximate Water Depth (ft): 3.7

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
0	Top 6" : Organic matter/process residue, black, silty, very soft, slight sheen		Sample CL-SD012-0000-0
1.0			
2.0	Sandy silt, (ML), brown, slightly moist, medium dense, medium grained		Sample CL-SD012-0015-0
3.0			
4.0			• Total drive = 5' • Total core recovered = 4'
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11/96 LC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD013

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/20/96

Sample Elevation (ft, NGVD): 0.7

Approximate Water Depth (ft): 14.5

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top1' : Organic matter/process residue, black, very soft		Sample CL-SD013-0000-0
2.0			
3.0	Silt, (ML), gray-green, very soft		Sample CL-SD013-0025-0
4.0			
5.0			• Total drive = 5' • Total core recovered = 4.5'
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

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CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD014

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/20/96

Sample Elevation (ft, NGVD): 4.5

Approximate Water Depth (ft): 10.7

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 4" : Organic matter/process residue, black, very soft		Sample CL-SD014-0000-0
2.0	Bottom: Silt, (ML), gray, soft		Sample CL-SD014-0015-0
3.0			
4.0			• Total drive = 5' • Total core recovered = 3.5'
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11/96 LC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD015

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/20/96

Sample Elevation (ft, NGVD): 7.6

Approximate Water Depth (ft): 7.6

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 1"-2" : Process residue (?), black, very soft, no odor or sheen		No sample collected
2.0	Bottom: Silt, (ML), green/gray, firm, slightly moist, slightly sandy, fine		CL-SD015-0010-0
3.0			• Total drive = 3' • Total core recovered = 2.5'
4.0			
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD016

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/20/96

Sample Elevation (ft, NGVD): -0.2

Approximate Water Depth (ft): 15.4

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
0	Top 2" : Process residue/organic material, black, very soft		CL-SD016-0000-0
1.0	3"– 6" : Poorly graded sand, (SP), medium to fine grained, brown		CL-SD016-0010-0
2.0	Silt, (ML), brown/gray, slightly sandy, firm		
3.0			• Total drive = 5' • Total core recovered = 3'
4.0			
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11/96 LC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD017

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/20/96

Sample Elevation (ft, NGVD): 10.4

Approximate Water Depth (ft): 4.8

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 1/2" : Possible process residue (?), gray, soft, no odor or sheen, may be just organic matter 1/2" – 1' : Poorly graded sand, (SP), silty, brown, loose, medium grained		CL-SD017-0000-0
2.0	Sandy silt, (ML), brown, fine grained, firm		CL-SD017-0015-0
3.0			
4.0			• Total drive = 5' • Total core recovered = 3.5'
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD021

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/20/96

Sample Elevation (ft, NGVD): 10.5

Approximate Water Depth (ft): 4.7

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 1.5' : Process residue, black, very soft, sheen, strong odor		CL-SD021-0000-0
2.0			
3.0	Silt, (ML), brown, soft, slightly sandy		CL-SD021-0020-0
4.0			• Total drive = 5' • Total core recovered = 3.5'
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11/96 LC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD018

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/20/96

Sample Elevation (ft, NGVD): 12.9

Approximate Water Depth (ft): 2.3

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 1.5' : Process residue/organic matter, dark gray, soft, silty, appears to be either a gray silt or residue, wood fragments in sample		CL-SD018-0000-0
2.0	Sandy silt, (ML), brown, soft to firm, fine-grained		CL-SD018-0020-0
3.0			
4.0			• Total drive = 5' • Total core recovered = 4'
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD019

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/20/96

Sample Elevation (ft, NGVD): 6.4

Approximate Water Depth (ft): 8.8

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 2' : Possible process residue, dark gray, silty, very soft		CL-SD019-0000-0
2.0			
3.0	Silt with sand, (ML), brown, fine grained, firm		CL-SD019-0030-0
4.0			• Total drive = 5' • Total core recovered = 4'
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11/96 LC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD020

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/20/96

Sample Elevation (ft, NGVD): 9.3

Approximate Water Depth (ft): 5.9

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 2' : Possible process residue, dark gray, silty, very soft		CL-SD020-0000-0
2.0			
3.0	Silt, (ML), brown, slightly sandy, fine grained, firm		CL-SD020-0025-0
4.0			• Total drive = 5' • Total core recovered = 4'
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11/

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD022

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/20/96

Sample Elevation (ft, NGVD): 8.7

Approximate Water Depth (ft): 6.5

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 2.5' : Process residue, black, very soft, odor, sheen		CL-SD022-0000-0
2.0			
3.0	Silty sand to sandy silt, (SM to ML), brown, medium dense, slightly clayey		CL-SD022-0030-0
4.0			
5.0			• Total drive = 5' • Total core recovered = 4.5'
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11/96 LC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD023

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/20/96

Sample Elevation (ft, NGVD): 12.9

Approximate Water Depth (ft): 2.3

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 1' : Process residue, black, very soft, sheen		CL-SD023-0000-0
2.0	Sandy silt, (ML), brown, firm, fine-grained		CL-SD023-0015-0
3.0			
4.0	4.2' : Silty sand, (SM), brown, medium dense		
5.0			• Total drive = 5' • Total core recovered = 4.5'
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 [illegible].LC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD024

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/20/96

Sample Elevation (ft, NGVD): 12.7

Approximate Water Depth (ft): 2.5

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 1' : Process residue, black, sheen, odor		CL-SD024-0000-0
2.0	Silt, (ML), brown/gray, firm		CL-SD024-0015-0
3.0			
4.0			• Total drive = 5' • Total core recovered =3.5'
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11/96 LC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD025

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/20/96

Sample Elevation (ft, NGVD): 12.3

Approximate Water Depth (ft): 2.9

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 0.8' : Process residue, black, very soft, sheen		CL-SD025-0000-0
2.0	Silt, (ML), brown/gray, firm		CL-SD025-0010-0
3.0			• Total drive = 5' • Total core recovered =3'
4.0			
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD026

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/20/96

Sample Elevation (ft, NGVD): 13.3

Approximate Water Depth (ft): 1.9

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 1.5' : Process residue/organic material, black, very soft, sheen		CL-SD026-0000-0
2.0			
3.0	Silt, (ML), brown, firm		CL-SD026-0020-0
4.0			• Total drive = 5' • Total core recovered =3.5'
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11/96 LC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD027

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/20/96

Sample Elevation (ft, NGVD): 11.1

Approximate Water Depth (ft): 4.1

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 2.5' : Process residue, black, clayey/silty, very soft, sheen		CL-SD027-0000-0
2.0			
3.0	Silt, (ML), medium brown, firm, slightly sandy		
4.0	Poorly graded sand, (SP), brown, medium dense, medium grained		CL-SD027-0038-0
5.0			• Total drive = 5' • Total core recovered = 5'
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 1

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.P1.02

Core No.: CL-SD028

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/20/96

Sample Elevation (ft, NGVD): 9.2

Approximate Water Depth (ft): 6.1

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 2.5' : Process residue, black, very soft, silty to clayey, sheen, odor		CL-SD028-0000-0 and duplicate CL-SD028-0000-1
2.0			
3.0	Sandy silt, (ML), brown/green, firm,		CL-SD028-0030-0 and duplicate CL-SD028-0030-1
4.0			
5.0	4' – 4.5' : Poorly graded sand, (SP), brown, medium dense, medium grained		• Total drive = 5' • Total core recovered = 5'
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11/96 LC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD029

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/20/96

Sample Elevation (ft, NGVD): 11.8

Approximate Water Depth (ft): 3.4

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 1.5' : Process residue, black, silty, very soft, very strong petroleum odor, sheen		CL-SD029-0000-0
2.0	Silty sand, (SM), brown, fine, medium dense		CL-SD029-0020-0
3.0			
4.0			• Total drive = 5' • Total core recovered = 3.5'
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD030

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/21/96

Sample Elevation (ft, NGVD): 12.1

Approximate Water Depth (ft): 3.2

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 2' : Process residue, black, clayey, sheen		CL-SD030-0000-0
2.0	2'–3.5' : Sandy silt, (ML), brown, fine, firm		
3.0	3.5' : Poorly graded sand, (SP), fine to medium grained, brown, medium dense		CL-SD030-0030-0
4.0			
5.0			• Total drive = 5' • Total core recovered = 4.5'
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11/96 LC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD031

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/21/96

Sample Elevation (ft, NGVD): 8.7

Approximate Water Depth (ft): 6.5

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 2.5' : Process residue, black, clayey, sheen		CL-SD031-0000-0
2.0			
3.0			
4.0	Silt, (ML), brown, soft		CL-SD031-0035-0
5.0			• Total drive = 5' • Total core recovered = 5'
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 C

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD032

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/21/96

Sample Elevation (ft, NGVD): 10.6

Approximate Water Depth (ft): 4.6

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 2' : Process residue, black, clayey, very soft, sheen		CL-SD032-0000-0
2.0	Silt, (ML), brown, soft, trace fine sand		
3.0	3.8' : Poorly graded sand, (SP), brown, medium grained, medium dense		CL-SD032-0030-0
4.0			• Total drive = 5' • Total core recovered = 4'
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11/96 LC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD033

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/21/96

Sample Elevation (ft, NGVD): 12.3

Approximate Water Depth (ft): 2.9

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 1.3' : Process residue, black, soft, silty, sheen		CL-SD033-0000-0
2.0			
3.0	Silt, (ML), brown, firm, little to no fine sand		CL-SD033-0025-0
4.0			• Total drive = 5' • Total core recovered = 4'
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11/96 EC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD034

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/21/96

Sample Elevation (ft, NGVD): 12.4

Approximate Water Depth (ft): 2.8

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 1.5' : Process residue, black, clayey, sheen		CL-SD034-0000-0
2.0	Silt, (ML), greenish brown, very soft		CL-SD034-0020-0
3.0			
4.0			• Total drive = 5' • Total core recovered = 3.5'
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11/96 LC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD035

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/21/96

Sample Elevation (ft, NGVD): 11.3

Approximate Water Depth (ft): 3.9

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 2' : Process residue, black, very soft, clayey, sheen		CL-SD035-0000-0
2.0			
3.0	Silt, (ML), brown, very soft		CL-SD035-0030-0
4.0			• Total drive = 5' • Total core recovered = 4'
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11/96 LC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD036

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/21/96

Sample Elevation (ft, NGVD): 9.2

Approximate Water Depth (ft): 6.0

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 2' : Process residue, black, clayey, very soft, sheen		CL-SD036-0000-0
2.0			
3.0	Silt, (ML), brown, very soft, slightly clayey		
4.0			CL-SD036-0035-0
	4.5' : Poorly graded sand, (SP), brown, fine, medium dense		
5.0			• Total drive = 5' • Total core recovered = 5'
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11/96 LC

CH2MHILL **Sediment Description Log**

RMC Company Lake SDG

Client: Reynolds Metals Company Project No.: 107493.PI.02

Core No.: CL-SD037

Sheet 1 of 1

Sampling Contractor: Advanced American Diving

Sampling Method: Ogeechee Sand Corer

Collection Date: 10/21/96

Sample Elevation (ft, NGVD): 10.5

Approximate Water Depth (ft): 4.8

Sample Collector(s): R. Johns, J. Tielens

Sample Logger: R. Johns

Depth Below Sediment Surface (ft)	Sediment Description Soil name, color, grain size, moisture content, relative density, structure ASTM D 2488 classification symbol	Symbol	Comments
1.0	Top 2.5' : Process residue, black, very soft, sheen		CL-SD037-0000-0
2.0			
3.0			
4.0	Silt, (ML), brown, fine grained, firm		CL-SD037-0035-0
5.0			• Total drive = 5' • Total core recovered = 5'
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			

107493.P1.08 11

PROJECT NUMBER	BORING NUMBER
107493.P1.02	CL-SD038 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Reynolds Metals - RMC-Troutdale - Company Lake SDG LOCATION West of Sand Pile

ELEVATION 24.45 DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT 9",OD 4 1/4" ID HSA; CME 55 Rig; 3" OD Split Spoon

WATER LEVELS Not Measured START 11-26-96 FINISH 11-26-96 LOGGER Rick Johns

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	2.5					
	4.0	1-S	1.0	8-8-7 (15)	POORLY GRADED SAND, (SP), brown, dry, medium dense, fine to medium, trace of silt.	
5.0	5.5	2-S	1.3	10-13-8 (21)	Same as above, (SP), fine gravel/coarse sand.	
	7.0	3-S	1.0	8-10-11 (21)	Same as above, (SP), piece of 1 inch rock at 6.5 feet, orange staining around rock, slightly moist.	
	8.5	4-S	1.4	10-7-7 (14)	Same as above, (SP), wet, silty.	
	10.0	5-S	1.3	6-7-7 (14)	Top 1.2 feet same as above, (SP), silty. Bottom 0.1 feet: SILTY SAND, (SM), brown, wet, medium dense, fine grained.	
10.0	11.5	6-S	0.4	4-6-6 (12)	SANDY SILT, (ML), brown/dark gray, wet, fine grained.	
	13.0	7-S	1.0	2-3-5 (8)	SILT, (ML), brown with dark gray staining, stiff, possible process residue.	Sample CL-SD038-0120-0 (12 - 13 feet)
	14.5	8-S	1.1	3-5-7 (12)	SILT, (ML), brown, no dark gray staining, stiff, rootlets; possible original ground surface.	
15.0	16.0	9-S	1.4	3-7-9 (16)	Top 0.2 feet same as above, (ML), Bottom 1.2 feet: POORLY GRADED SAND, (SP), wet, medium dense, coarse grained to medium grained.	Sample CL-SD038-0150-0 (15 - 16 feet)
						Boring Terminated at 16 feet.
						Backfill hole with 3/8 inch Bentonite Chips
20.0						
25.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
107493.P1.02	CL-SD039 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Reynolds Metals - RMC-Troutdale - Company Lake SDG LOCATION West of Sand Pile

ELEVATION 21.21 DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT 9",OD 4 1/4" ID HSA; CME 55 Rig; 3" OD Split Spoon

WATER LEVELS Not Measured START 11-26-96 FINISH 11-26-96 LOGGER Rick Johns

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	2.5					
	4.0	1-S	1.0	3-5-6 (11)	POORLY GRADED SAND, (SP), brown, slightly moist, medium dense, medium grained, silty.	
5.0	5.0					
	6.5	2-S	1.0	3-3-3 (6)	Top 0.7 feet same as above, (SP), Bottom 0.3 feet: SANDY SILT, (ML), brown, slightly moist, firm, fine grained sand.	
	7.5					
	9.0	3-S	1.0	5-5-5 (10)	SILT, (ML), brown/gray, slightly moist, firm, trace fine sand. At 8 feet, dark gray stained, possible process residue.	Sample CL-SD039-0075-0 (7.5 - 9 feet)
10.0	10.5	4-S	0.5	2-3-5 (8)	Same as above, (ML), piece of 1 inch wood and organics in sample, no staining; possible original ground surface.	
	12.0	5-S	1.0	2-10-14 (24)	Top 0.8 feet: Same as above, (ML), Bottom 0.2 feet: POORLY GRADED SAND, (SP), wet, coarse grained.	
	13.5	6-S	1.0	5-8-7 (15)	Same as above, (SP).	Sample CL-SD039-0120-0 (12 - 13 feet)
15.0						Boring Terminated at 13.5 feet. Backfill hole with 3/8 inch Bentonite Chips
20.0						
25.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
107493.P1.02	CL-SD040

SHEET 1 OF 1

SOIL BORING LOG

PROJECT Reynolds Metals - RMC-Troutdale - Company Lake SDG LOCATION East of Sand Pile

ELEVATION 39.90 DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT 9",OD 4 1/4" ID HSA; CME 55 Rig; 3" OD Split Spoon

WATER LEVELS Not Measured START 11-27-96 FINISH 11-27-96 LOGGER Rick Johns

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
5.0					POORLY GRADED SAND, (SP), brown, dry, medium grained, fill.	
10.0	10.0					
	11.5	1-S	1.5	10-15-15 (30)	Same as above, (SP), dense, slightly moist.	
	13.0	2-S	1.5	27-30-31 (61)	Same as above, (SP), pieces of 3/4 inch to 1 inch gravel.	
	14.5	3-S	1.5	10-12-15 (27)	Same as 1-S, (SP).	
15.0	16.0	4-S	1.5	10-20-22 (42)	Same as above, (SP).	
	17.5	5-S	1.5	10-15-15 (30)	Same as above, (SP).	
	19.0	6-S	1.5	10-20-20 (40)	Same as above, (SP).	
20.0	20.5	7-S	1.2	8-6-6 (12)	Same as above, (SP), medium dense.	
	22.0	8-S	1.5	4-5-5 (10)	Same as above, (SP), wet.	
	23.5	9-S	1.1	7-7-9 (16)	Same as above, (SP).	
	25.0	10-S	1.0	5-8-8 (16)	Top 0.5 feet same as above, (SP), Bottom 0.5 feet: SILT, (ML), brown, wet, firm, wood fragments, no indication of process residue; possible original ground surface.	Sample CL-SD040-0235-0 (23.5 - 25 feet)
25.0	26.5	11-S	1.3	2-4-6 (10)	POORLY GRADED SAND, (SP), brown, wet, medium to fine grained, silty.	
	28.0	12-S	1.2	2-4-8 (12)	Same as above (SP).	
	28.5					
	30.0	13-S	1.2	2-6-10 (16)	Same as above (SP).	Boring Terminated at 30 feet. Backfill hole with 3/8 inch Bentonite Chips.

ATTACHMENT B

Cross Sections

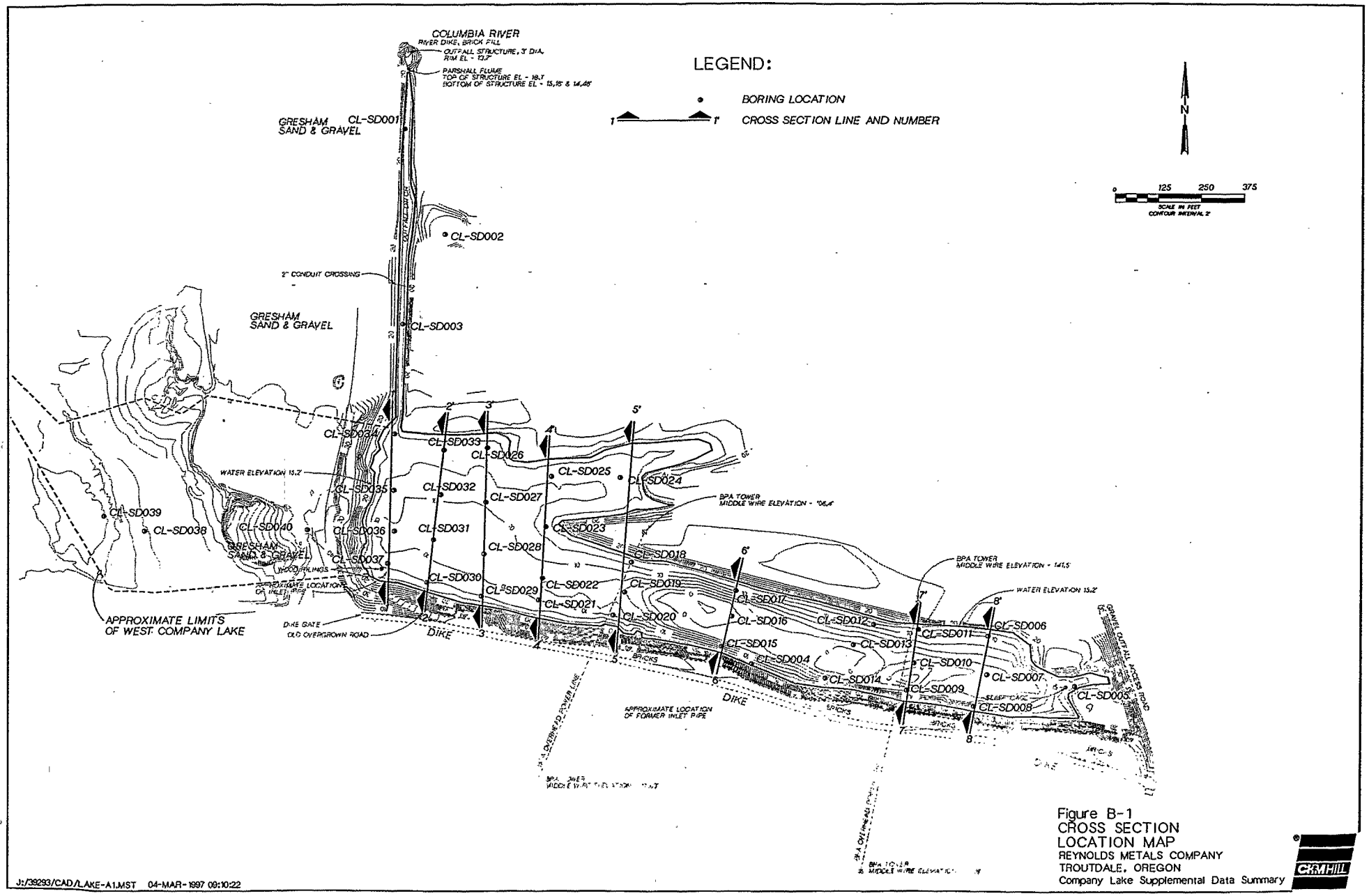

Figure B-1
CROSS SECTION
LOCATION MAP
REYNOLDS METALS COMPANY
TROUTDALE, OREGON
Company Lake Supplemental Data Summary

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AN-1997 9293SG82.DWG

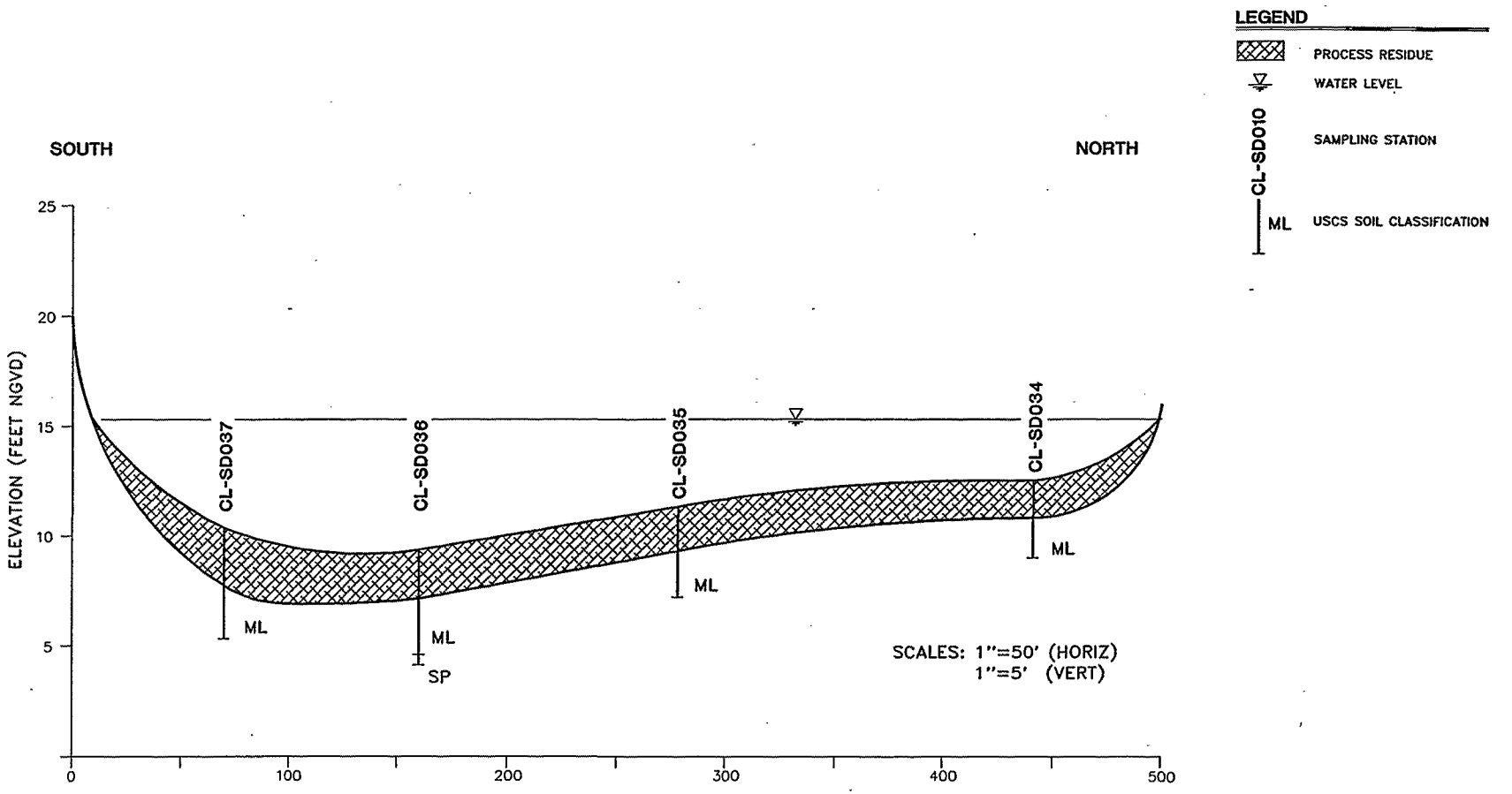


Figure B-2
COMPANY LAKE
CROSS SECTION 1-1'
REYNOLDS METALS COMPANY
TROUTDALE, OREGON
Company Lake Supplemental Data Summary

CH2MHILL

LR
06-JAN-1997 9293SG83.DWG

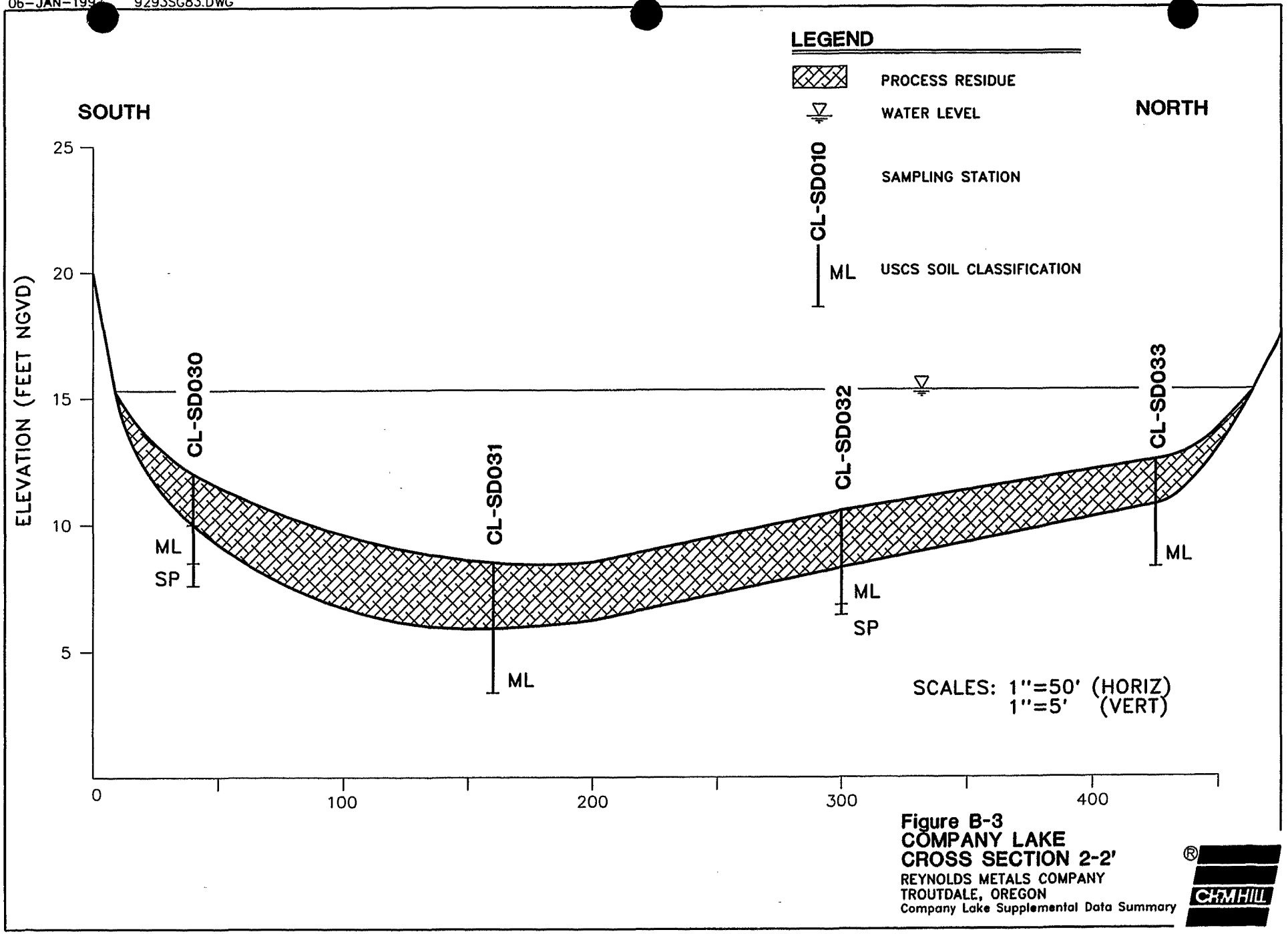
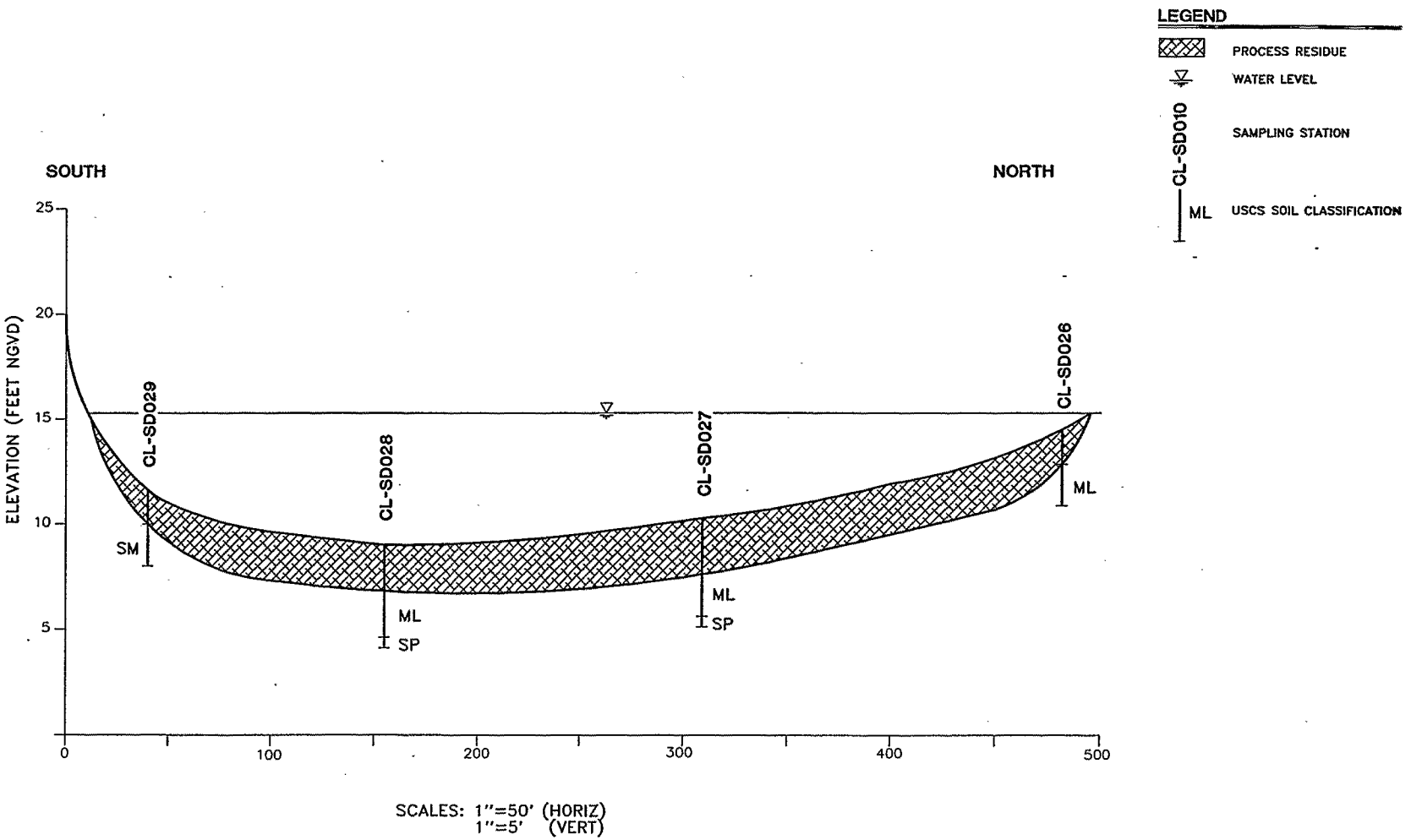


Figure B-3
COMPANY LAKE
CROSS SECTION 2-2'
REYNOLDS METALS COMPANY
TROUTDALE, OREGON
Company Lake Supplemental Data Summary

CH2MHILL

ALR
06-JAN-1997 9293SC84.DWG



SCALES: 1"=50' (HORIZ)
1"=5' (VERT)

Figure B-4
COMPANY LAKE
CROSS SECTION 3-3'
REYNOLDS METALS COMPANY
TROUTDALE, OREGON
Company Lake Supplemental Data Summary

CH2MHILL

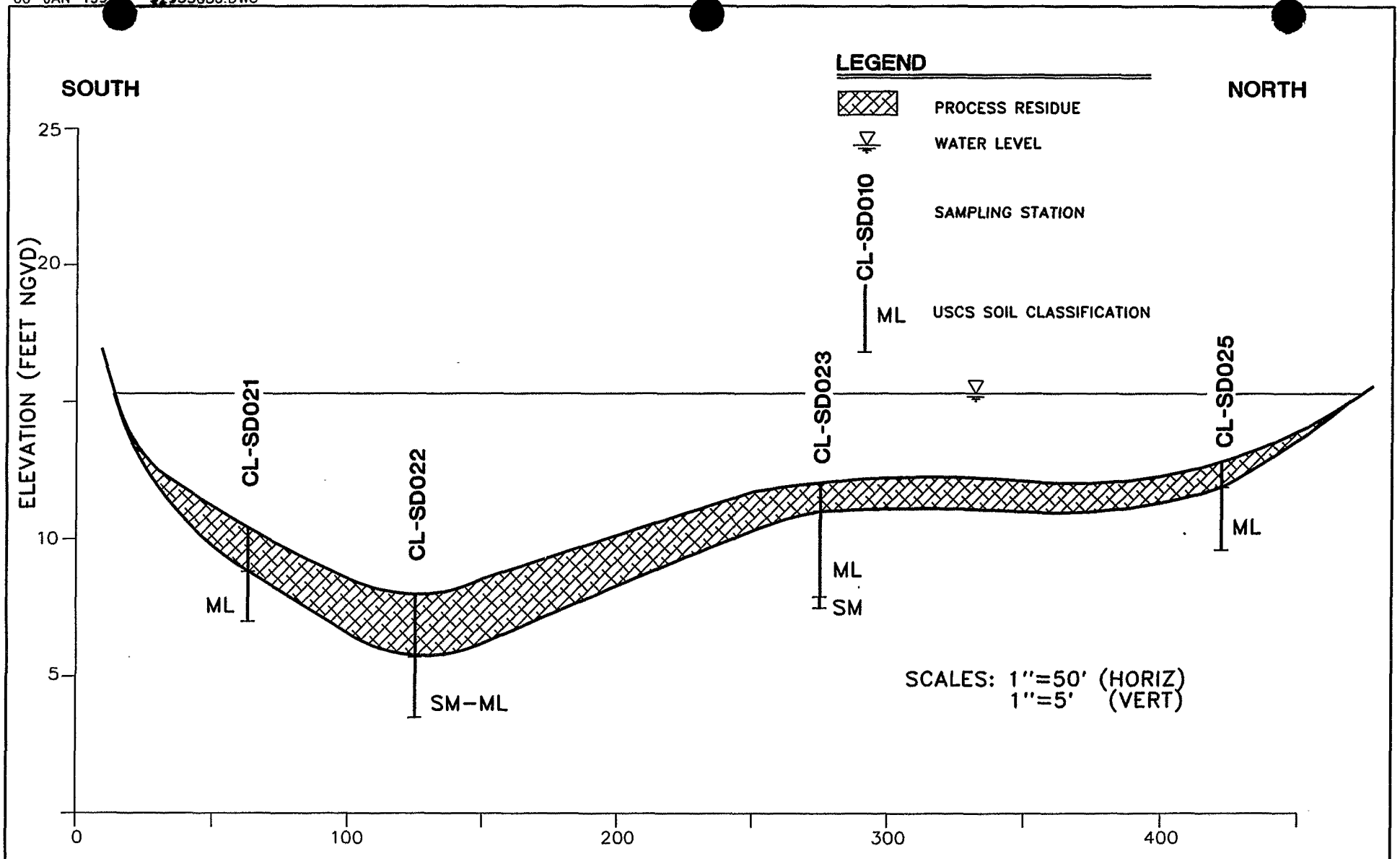


Figure B-5
COMPANY LAKE
CROSS SECTION 4-4'
REYNOLDS METALS COMPANY
TROUTDALE, OREGON
Company Lake Supplemental Data Summary

CH2MHILL

ALR
16-DEC-1996 9293SD93.DWG

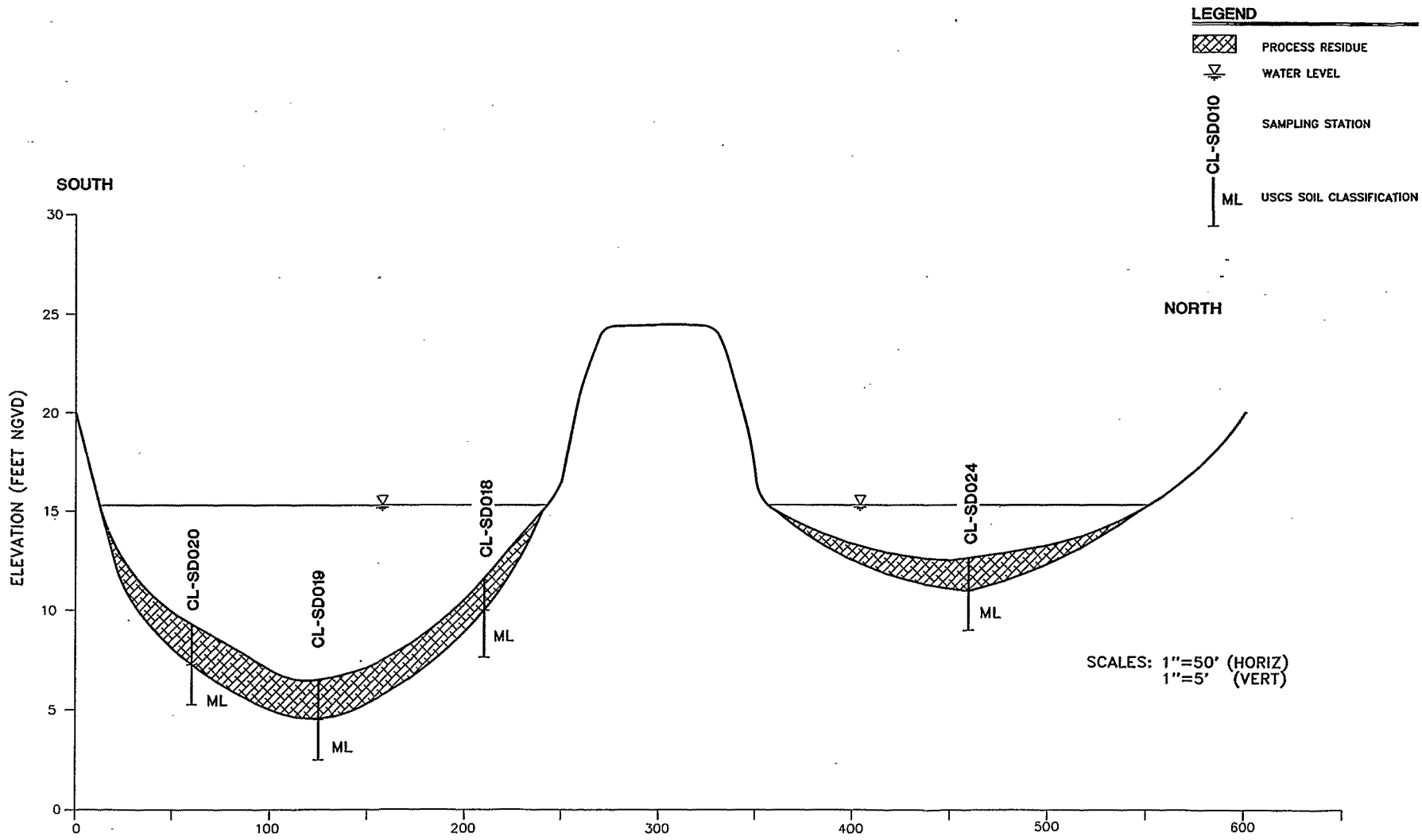
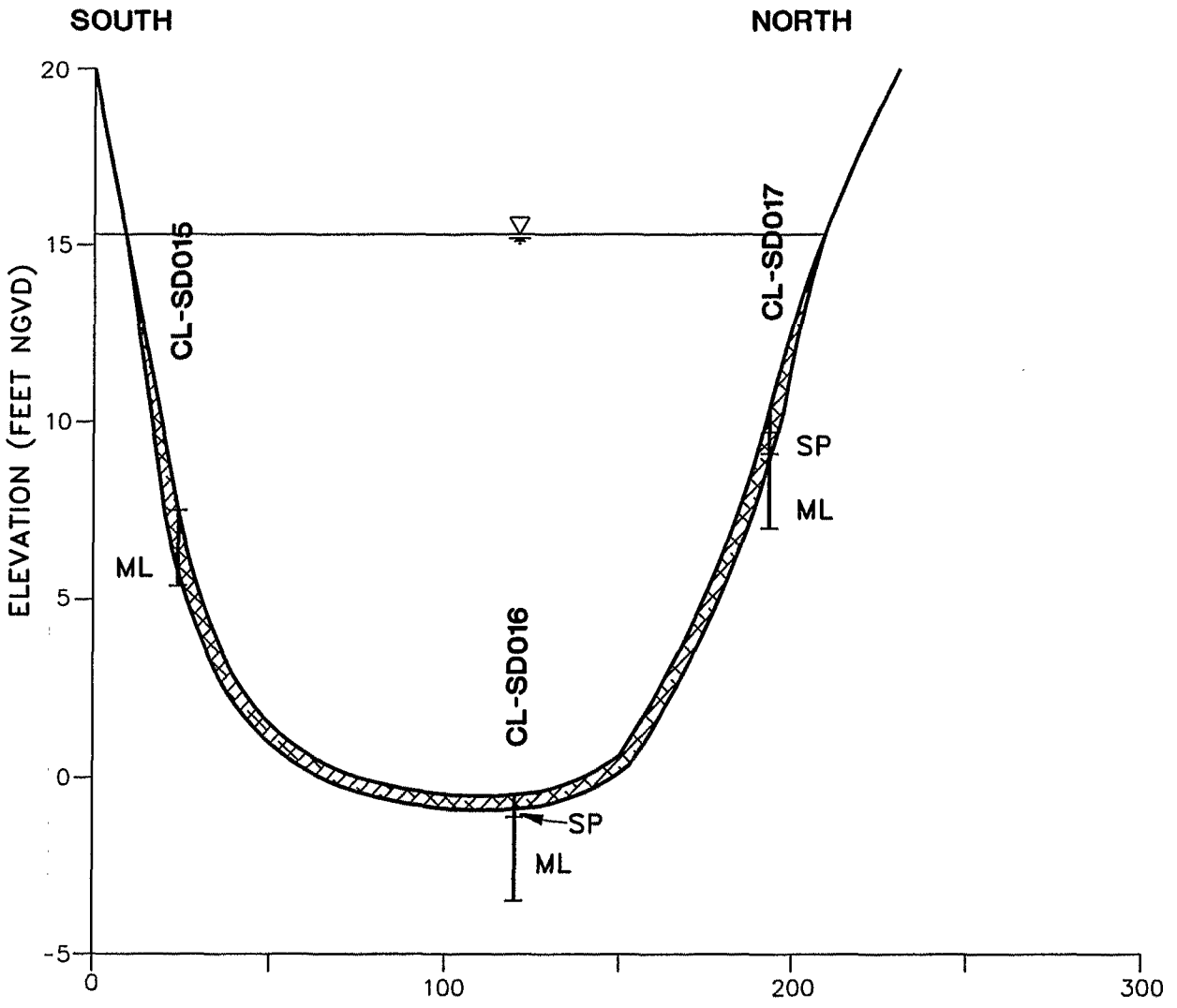


Figure B-6
COMPANY LAKE
CROSS SECTION 5-5'
REYNOLDS METALS COMPANY
TROUTDALE, OREGON
Company Lake Supplemental Data Summary

CH2MHILL



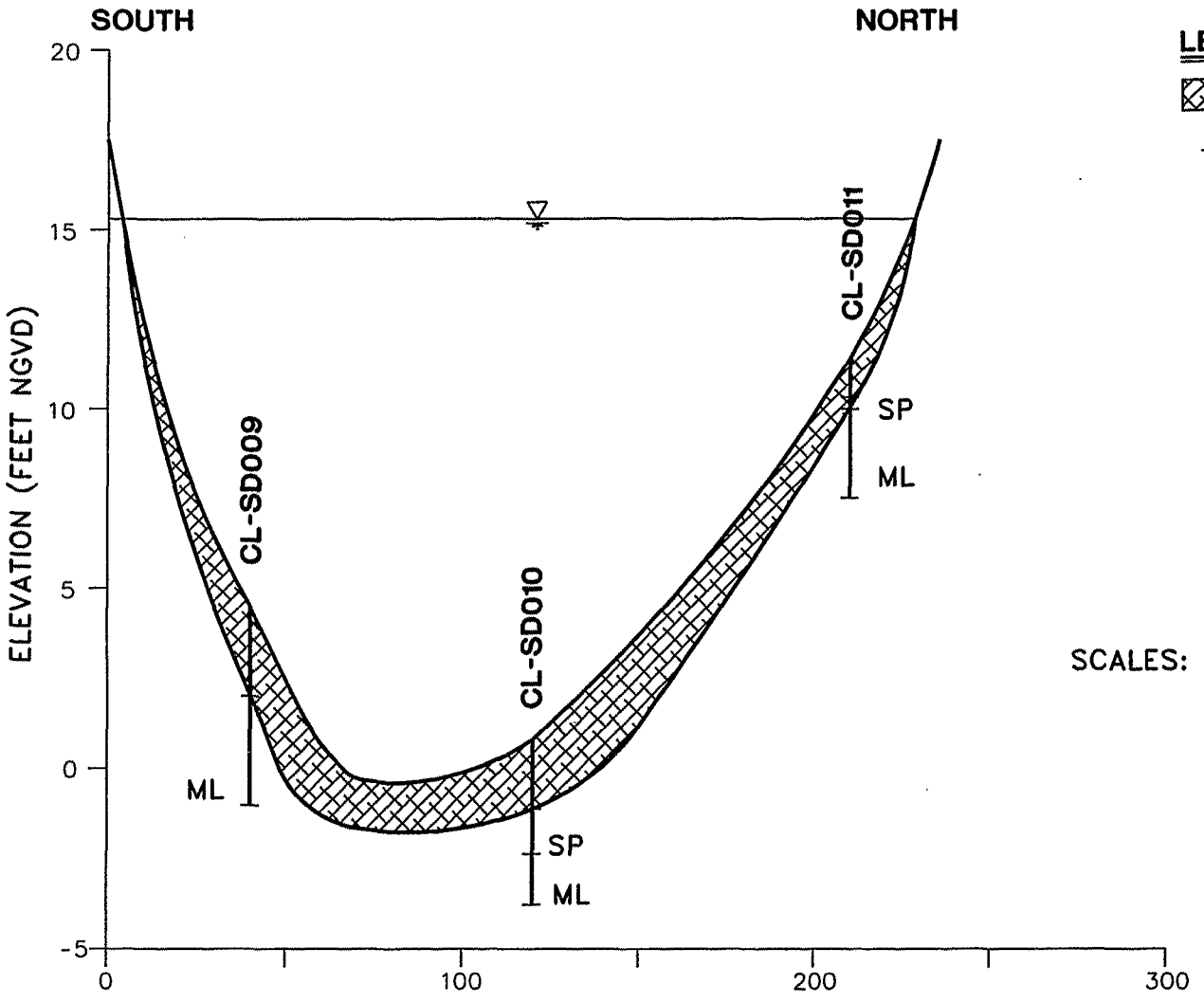
LEGEND

- PROCESS RESIDUE
- WATER LEVEL
- CL-SD010 — SAMPLING STATION
- ML — USCS SOIL CLASSIFICATION

SCALES: 1"=50' (HORIZ)
1"=5' (VERT)

Figure B-7
COMPANY LAKE
CROSS SECTION 6-6'
REYNOLDS METALS COMPANY
TROUTDALE, OREGON
Company Lake Supplemental Data Summary

CH2M HILL



LEGEND

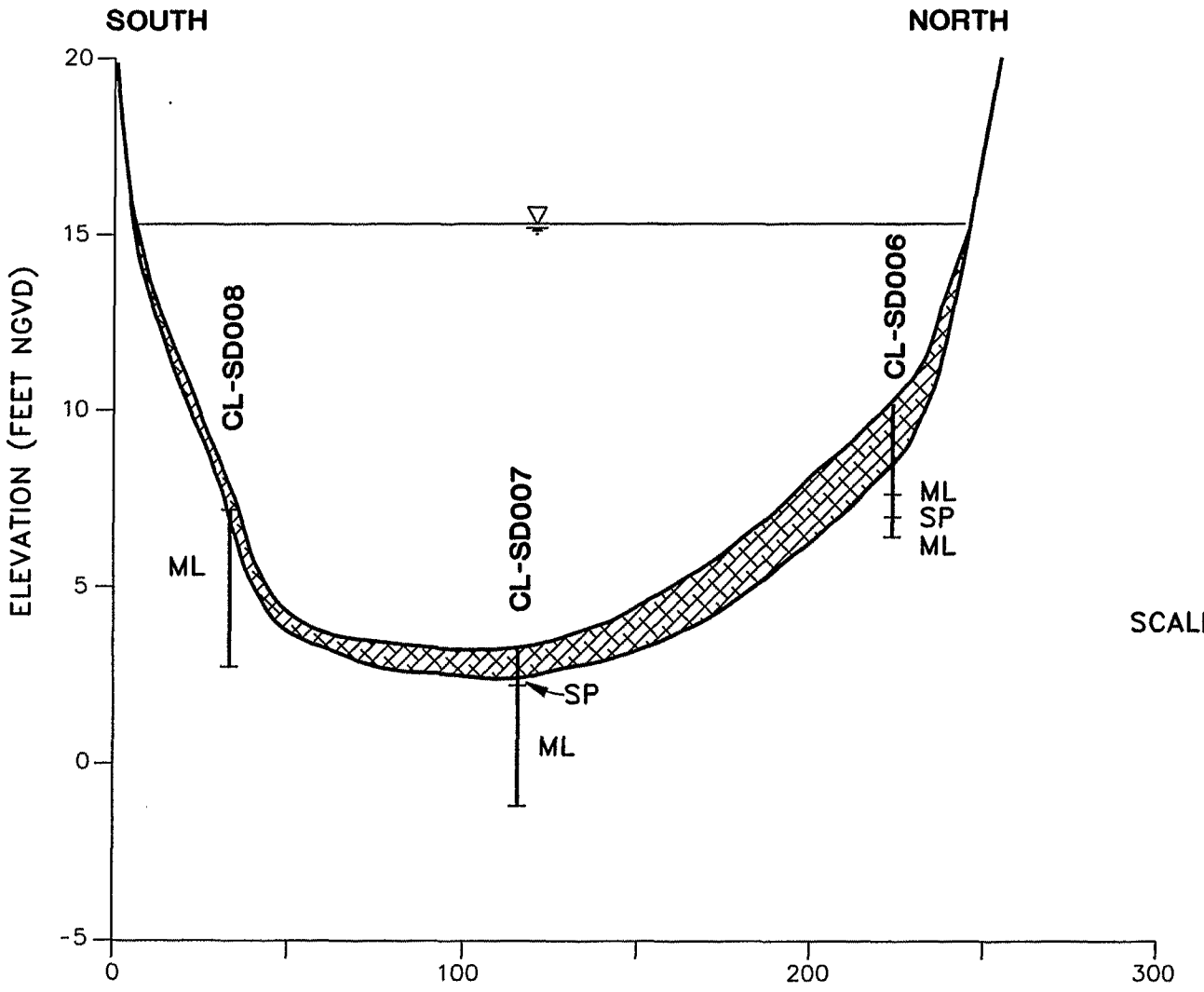
- PROCESS RESIDUE
- WATER LEVEL
- CL-SD010 — SAMPLING STATION
- ML — USCS SOIL CLASSIFICATION

SCALES: 1"=50' (HORIZ)
1"=5' (VERT)

Figure B-8
COMPANY LAKE
CROSS SECTION 7-7'
REYNOLDS METALS COMPANY
TROUTDALE, OREGON
Company Lake Supplemental Data Summary

CH2M HILL

LR
06-JAN-1993 9293SG92.DWG



LEGEND

PROCESS RESIDUE

WATER LEVEL

CL-SD010 — SAMPLING STATION

ML — USCS SOIL CLASSIFICATION

SCALES: 1"=50' (HORIZ)
1"=5' (VERT)

Figure B-9
COMPANY LAKE
CROSS SECTION 8-8'
REYNOLDS METALS COMPANY
TROUTDALE, OREGON
Company Lake Supplemental Data Summary

CH2M HILL

ATTACHMENT C

Laboratory Physical Test Results

Hydrometer Analysis

With Mechanical Grain Size Analysis

ASTM D422

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT CH2M Hill

JOB NO. 2040-48

BORING NO.		SAMPLED	10-21-96
DEPTH		DATE TESTED	11-17-96 CAL
SAMPLE NO.	CL-SD024-0000-0	WASH SIEVE	Yes
SOIL DESCR.	PO# 107493.P1.03	DRY SIEVE	No

MOISTURE DATA

HYGROSCOPIC	Yes	
NATURAL	No	
Wt. Wet Soil & Pan (g)		34.73
Wt. Dry Soil & Pan (g)		34.09
Wt. Lost Moisture (g)		0.64
Wt. of Pan Only (g)		3.83
Wt. of Dry Soil (g)		30.26
Moisture Content %		2.1
Wt. Hydrom. Sample Wet (g)		59.00
Wt. Hydrom. Sample Dry (g)		57.77

WASH SIEVE ANALYSIS

Wt. Total Sample Wet (g)	115.19
Weight of + #10 Before Washing (g)	0.00
Weight of + #10 After Washing (g)	0.00
Weight of - #10 Wet (g)	115.19
Weight of - #10 Dry (g)	112.80
Wt. Total Sample Dry (g)	112.80
Calc. Wt. "W" (g)	57.77
Calc. Mass + #10	0.00

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	0.00	0.00	0.00	0.0	100.0
3/4"	0.00	0.00	0.00	0.00	0.0	100.0
3/8"	0.00	0.00	0.00	0.00	0.0	100.0
#4	0.00	0.00	0.00	0.00	0.0	100.0
#10	0.00	0.00	0.00	0.00	0.0	100.0
#20	2.29	2.39	0.10	0.10	0.2	99.8
#40	2.32	2.49	0.17	0.27	0.5	99.5
#60	2.28	2.43	0.15	0.42	0.7	99.3
#100	2.30	2.59	0.29	0.71	1.2	98.8
#200	2.28	3.22	0.94	1.65	2.9	97.1

Data entered by: NAA Date: 11-20-96
Data checked by: DLS Date: 11-20-96
FileName:C2HOSD24

ADVANCED TERRA TESTING, INC.

HYDROMETER ANALYSIS - SEDIMENTATION DATA

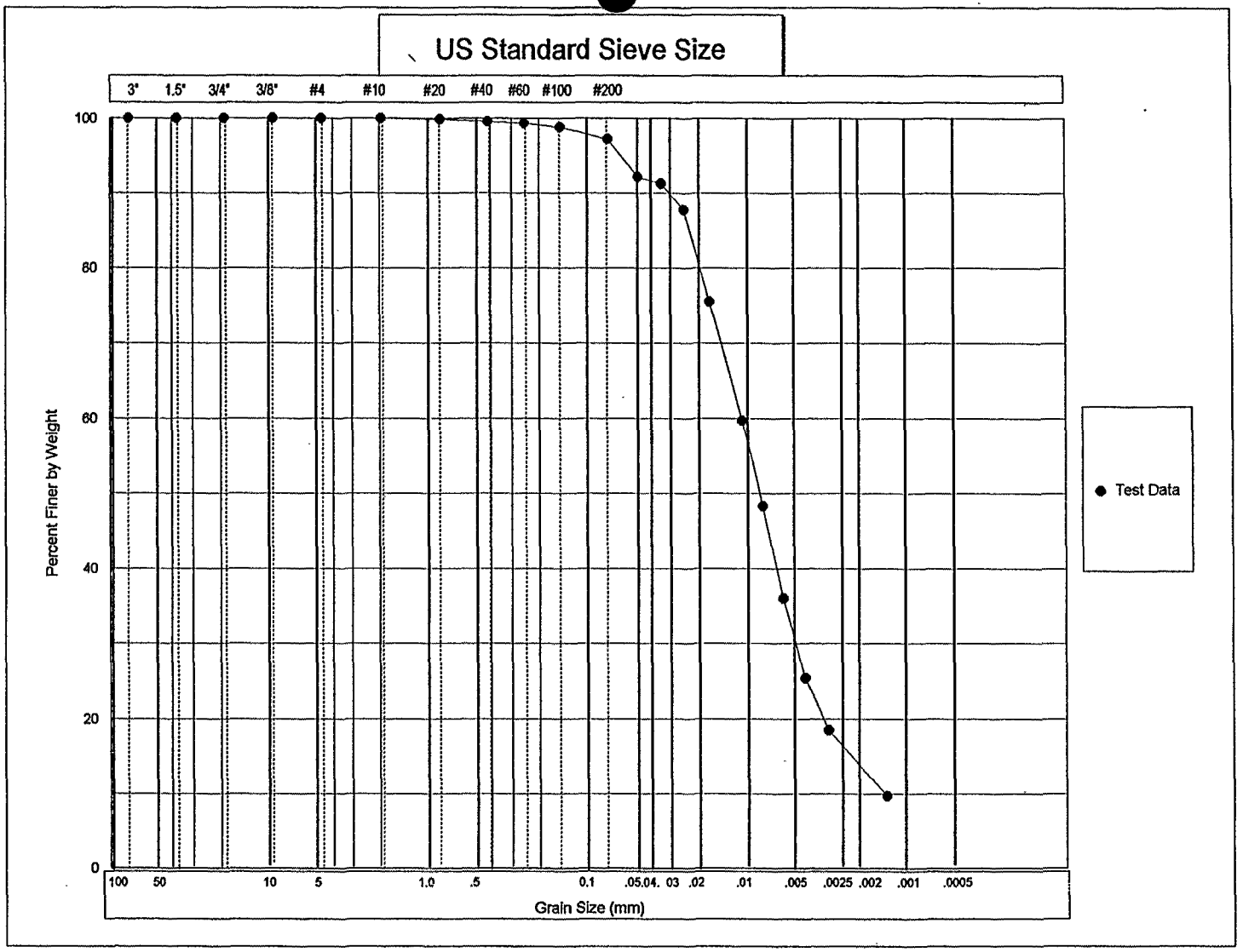
CLIENT	CH2M Hill	JOB NO.	2040-48
BORING NO.		SAMPLED	10-21-96
DEPTH		DATE TESTED	11-17-96 CAL
SAMPLE NO.	CL-SD024-0000-0	WASH SIEVE	Yes
SOIL DESCR.	PO# 107493.P1.03	DRY SIEVE	No

Hydrometer #	ASTM 152 H	Temp., Deg. C	24.0
Sp. Gr. of Soil	2.58	Temp. Coef. K	0.01329
Value of "alpha"	1.01	Wt. Dry Sample "W"	57.774
Deflocculant	Sodium Hexametaphosphate	% of Total Sample	100.0
Defloc. Corr'n	5.5		
Meniscus Corr'n	-1.0		

T Elapsed Time (min)	Hydrometer Reading Original	Corrected "R"	100Ra/W	% Total Sample	Effective Depth L	Grain Diameter (mm)
0.0	--	--	--	--	--	--
0.5	59.00	52.50	92.1	92.1	6.61	0.0484
1.0	58.50	52.00	91.3	91.3	6.70	0.0344
2.0	56.50	50.00	87.8	87.8	7.02	0.0249
5.0	49.50	43.00	75.5	75.5	8.17	0.0170
15.0	40.50	34.00	59.7	59.7	9.65	0.0107
30.0	34.00	27.50	48.3	48.3	10.71	0.0079
60.0	27.00	20.50	36.0	36.0	11.86	0.0059
120.0	21.00	14.50	25.4	25.4	12.85	0.0043
250.0	17.03	10.53	18.5	18.5	13.50	0.0031
1428.0	12.00	5.50	9.7	9.7	14.32	0.0013

Grain Diameter = K*(SQRT(L/T))

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES	PEBBLE GRAVEL				SAND			SILT	CLAY
TO BOULDERS	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: CH2M Hill Boring No.: Sample No.: CL-SD024-0000-0

Depth: Job Number: 2040-48

Classification:_____

Advanced Terra Testing, Inc.

Grain Size Analysis

3-Inch to -2 Sieve

ASTM D422

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D-422

CLIENT CH2M HILL

JOB NO. 2040-48

BORING NO.	PO#107493.P1.03	SAMPLED	10-20-96
DEPTH		DATE TESTED	11-15-96 DLS
SAMPLE NO.	CLSD023-0015-0	WASH SIEVE	Yes
SOIL DESCR.		DRY SIEVE	No

MOISTURE DATA

Wt. Wet Soil & Pan	(g)	221.3
Wt. Dry Soil & Pan	(g)	177.1
Wt. Lost Moisture	(g)	44.2
Wt. of Pan Only	(g)	8.4
Wt. of Dry Soil	(g)	168.8
Moisture Content	%	26.2

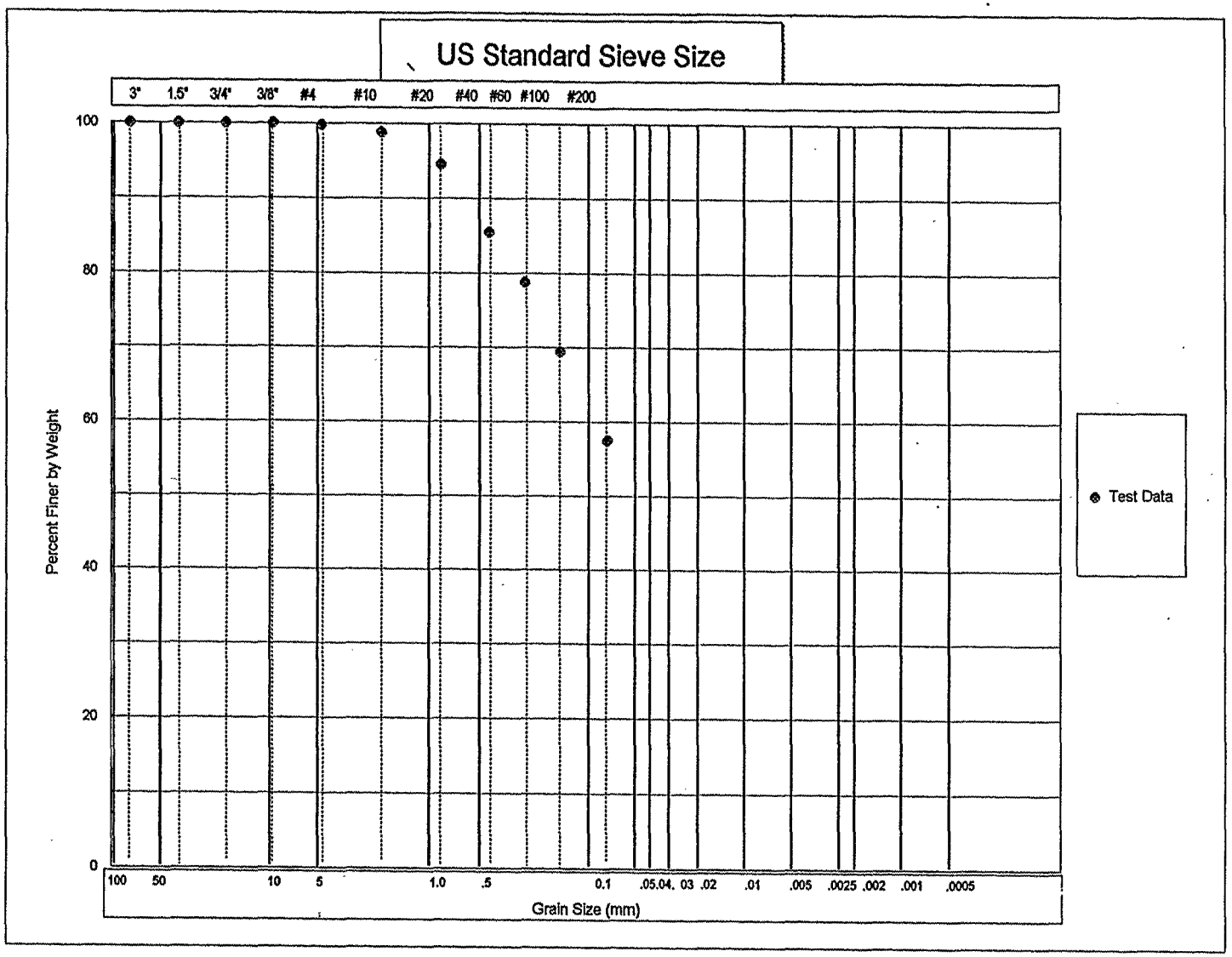
WASH SIEVE ANALYSIS

Wt. Wet Soil & Pan Before Washing (g)	221.3
Wt. Dry Soil & Pan Before Washing (g)	177.1
Weight of Pan (g)	8.4
Wt. of Dry Soil Before Washing	168.8
Wt. Dry Soil & Pan After Washing (g)	80.1
Wt. of Dry Soil After Washing (g)	71.8
-#200 Wash. Out %	57.5

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	0.00	0.00	0.00	0.0	100.0
3/4"	0.00	0.00	0.00	0.00	0.0	100.0
3/8"	0.00	0.00	0.00	0.00	0.0	100.0
#4	3.71	4.11	0.40	0.40	0.2	99.8
#10	3.97	5.56	1.59	1.99	1.2	98.8
#20	3.69	11.00	7.31	9.30	5.5	94.5
#40	3.70	18.87	15.17	24.47	14.5	85.5
#60	3.67	15.00	11.33	35.80	21.2	78.8
#100	3.72	19.44	15.72	51.52	30.5	69.5
#200	3.61	23.84	20.23	71.75	42.5	57.5

Data entered by: DLS Date: 11-18-96
Data checked by: DPM Date: 11-18-96
FileName:C2S00230

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES	PEBBLE GRAVEL				SAND			SILT	CLAY
TO BOULDERS	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: CH2M HILL Boring No.: PO#107493.P1.03 Sample No.: CLSD023-0015-0

Job Number: 2040-48 Depth:

Classification_____

Advanced Terra Testing, Inc.

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D-422

CLIENT CH2M HILL

JOB NO. 2040-48

BORING NO.	PO#107493.P1.03	SAMPLED	10-12-96
DEPTH		DATE TESTED	11-15-96 DLS
SAMPLE NO.	CL-SD030-0035-0	WASH SIEVE	Yes
SOIL DESCR.	CL-SD030-0035-0	DRY SIEVE	No

WASH SIEVE ANALYSIS

Wt. Wet Soil & Pan Before Washing (g)	255.3
Wt. Dry Soil & Pan Before Washing (g)	251.1
Weight of Pan (g)	8.2
Wt. of Dry Soil Before Washing	242.9
Wt. Dry Soil & Pan After Washing (g)	246.8
Wt. of Dry Soil After Washing (g)	238.7
-#200 Wash. Out %	1.7

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	0.00	0.00	0.00	0.0	100.0
3/4"	0.00	0.00	0.00	0.00	0.0	100.0
3/8"	0.00	0.00	0.00	0.00	0.0	100.0
#4	3.55	3.81	0.26	0.26	0.1	99.9
#10	3.64	18.56	14.92	15.18	6.2	93.8
#20	3.73	88.02	84.29	99.47	41.0	59.0
#40	3.71	77.60	73.89	173.36	71.4	28.6
#60	3.66	53.54	49.88	223.24	91.9	8.1
#100	3.69	14.54	10.85	234.09	96.4	3.6
#200	3.74	8.32	4.58	238.67	98.3	1.7

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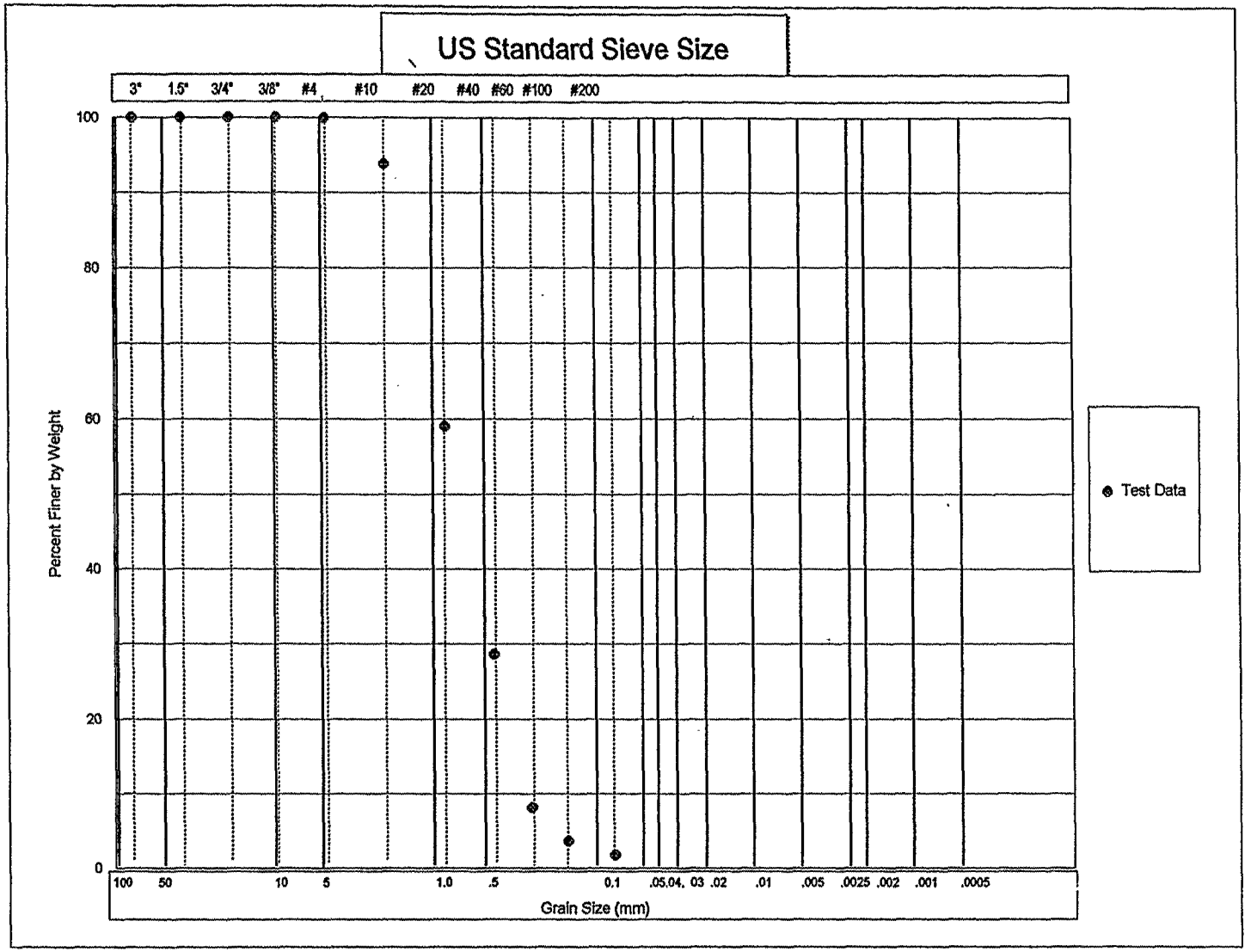
ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES	PEBBLE GRAVEL				SAND			SILT	CLAY
TO BOULDERS	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: CH2M HILL Boring No.: PO#107493.P1.03 Sample No.: CL-SD030-0035-0

Job Number: 2040-48 Depth:

Classification_____

Advanced Terra Testing, Inc.

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D-422

CLIENT CH2M Hill

JOB NO. 2040-48

BORING NO.
DEPTH
SAMPLE NO. CL-SD029-0020-0
SOIL DESCR. PO# 107493.P1.03

SAMPLED 10-20-96
DATE TESTED 11-11-96 ARH
WASH SIEVE Yes
DRY SIEVE No

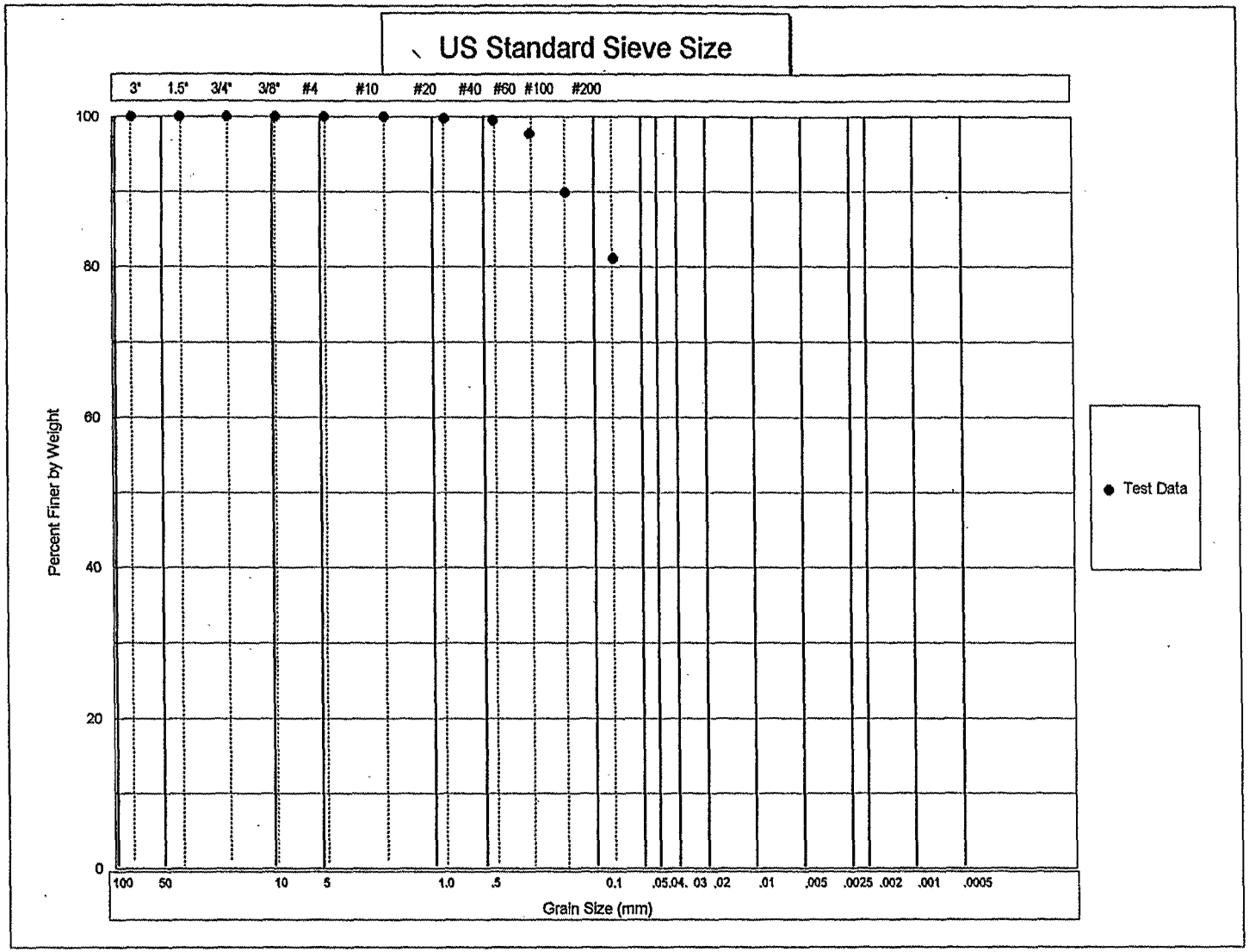
WASH SIEVE ANALYSIS

Wt. Wet Soil & Pan Before Washing (g)	218.5
Wt. Dry Soil & Pan Before Washing (g)	208.2
Weight of Pan (g)	8.3
Wt. of Dry Soil Before Washing	199.9
Wt. Dry Soil & Pan After Washing (g)	46.1
Wt. of Dry Soil After Washing (g)	37.7
-#200 Wash. Out %	81.1

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	0.00	0.00	0.00	0.0	100.0
3/4"	0.00	0.00	0.00	0.00	0.0	100.0
3/8"	0.00	0.00	0.00	0.00	0.0	100.0
#4	0.00	0.00	0.00	0.00	0.0	100.0
#10	0.00	0.00	0.00	0.00	0.0	100.0
#20	3.70	4.13	0.43	0.43	0.2	99.8
#40	3.67	4.34	0.67	1.10	0.6	99.4
#60	3.81	7.31	3.50	4.60	2.3	97.7
#100	3.77	19.28	15.51	20.11	10.1	89.9
#200	3.67	21.29	17.62	37.73	18.9	81.1

Data entered by: NAA Date: 11-12-96
Data checked by: DLS Date: 11-12-96
FileName:C2M0SD29

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES	PEBBLE GRAVEL				SAND			SILT	CLAY
TO BOULDERS	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: CH2M Hill Boring No.: Sample No.: CL-SD029-0020-0

Job Number: 2040-48 Depth:

Classification_____

Advanced Terra Testing, Inc.

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D-422

CLIENT CH2M Hill

JOB NO. 2040-48

BORING NO.
DEPTH
SAMPLE NO. CL-SD012-0015-0
SOIL DESCR. PO# 107493.P1.03

SAMPLED 10-19-96
DATE TESTED 11-11-96 ARH
WASH SIEVE Yes
DRY SIEVE No

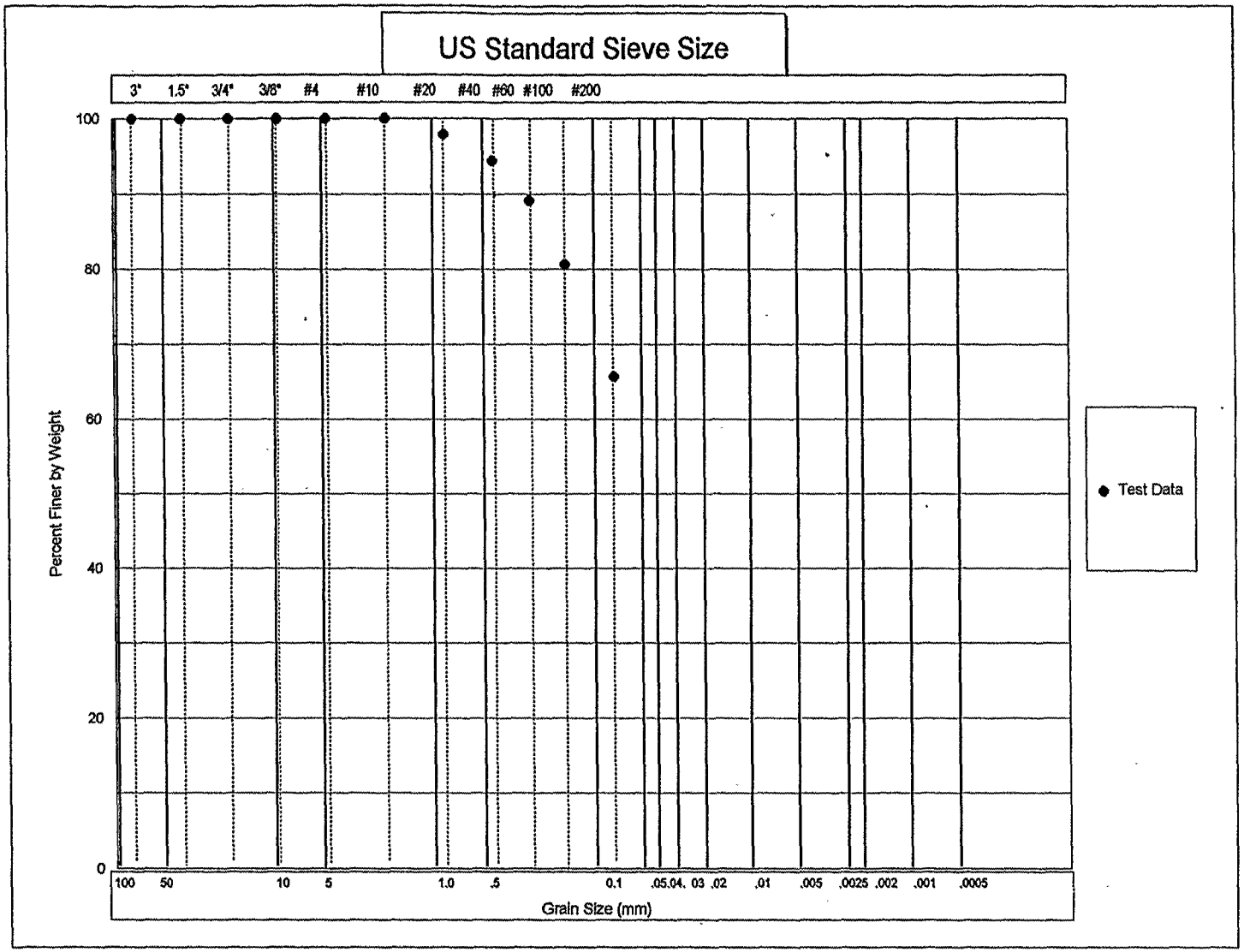
WASH SIEVE ANALYSIS

Wt. Wet Soil & Pan Before Washing (g)	438.7
Wt. Dry Soil & Pan Before Washing (g)	255.9
Weight of Pan (g)	8.6
Wt. of Dry Soil Before Washing	247.4
Wt. Dry Soil & Pan After Washing (g)	93.3
Wt. of Dry Soil After Washing (g)	84.7
-#200 Wash. Out %	65.8

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	0.00	0.00	0.00	0.0	100.0
3/4"	0.00	0.00	0.00	0.00	0.0	100.0
3/8"	0.00	0.00	0.00	0.00	0.0	100.0
#4	0.00	0.00	0.00	0.00	0.0	100.0
#10	0.00	0.00	0.00	0.00	0.0	100.0
#20	3.79	8.90	5.11	5.11	2.1	97.9
#40	3.68	12.35	8.67	13.78	5.6	94.4
#60	3.78	16.81	13.03	26.81	10.8	89.2
#100	3.82	24.86	21.04	47.85	19.3	80.7
#200	3.72	40.57	36.85	84.70	34.2	65.8

Data entered by: NAA Date: 11-12-96
Data checked by: DLS Date: 11-12-96
FileName:C2MOSD12

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES	PEBBLE GRAVEL				SAND			SILT	CLAY
TO BOULDERS	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: CH2M Hill Boring No.: Sample No.: CL-SD012-0015-0

Job Number: 2040-48 Depth:

Classification_____

Advanced Terra Testing, Inc.

APPENDIX D

Laboratory Analytical Data Summaries

EPA Defined Qualifiers

Organic Compounds

U = The compound was analyzed for but not detected.
J = Estimated concentration.
J = Value is estimated as a result of QA review.
B = The compound was found in the associated blank as well as the sample.
D = Compound has been run at a dilution to bring the concentration of that compound within the linear range of the instrument.
E = Concentration exceeds the linear range of the instrument; associated value is estimated.
R = Result is rejected owing to gross QA/QC outliers; presence or absence of material cannot be certain.
X = Compound concentration has been manually modified or the EPA qualifier has been manually modified or added.
JX = This value is less than the sample quantitation limit that would have been displayed for "U."

Inorganic Compounds

U = Constituent not detected at associated practical quantitation limit.
J = Value is estimated as a result of QA review.
B = Estimated value; value is greater than the instrument detection limit, but less than the contract required detection limit.
R = Result is rejected owing to gross QA/QC outliers; presence or absence of material cannot be certain.
L = Analyte present. Reported value may be biased low; actual value is expected to be higher.
UL = The compound was analyzed for but not detected. Reported detection limit may be biased low; actual detection limit is expected to be higher.
K = Analyte present. Reported value may be biased high; actual value is expected to be lower.

Table D-1
Surface Soil and Sediment Sample Analytical Results for 1996

Sample ID:	CL-SD001-0000-0	CL-SD002-0000-0	CL-SD003-0000-0	CL-SD004-0000-0	CL-SD005-0000-0	CL-SD009-0000-0	CL-SD011-0000-0	CL-SD013-0000-0	CL-SD018-0000-0	CL-SD019-0000-0	CL-SD020-0000-0	CL-SD022-0000-0	CL-SD024-0000-0	CL-SD028-0000-0	CL-SD032-0000-0	CL-SD034-0000-0	CL-SD037-0000-0
Station ID:	CL-SD001	CL-SD002	CL-SD003	CL-SD004	CL-SD005	CL-SD009	CL-SD011	CL-SD013	CL-SD018	CL-SD019	CL-SD020	CL-SD022	CL-SD024	CL-SD028	CL-SD032	CL-SD034	CL-SD037
Date Sampled:	10/15/96	10/15/96	10/15/96	10/16/96	10/19/96	10/19/96	10/19/96	10/20/96	10/20/96	10/20/96	10/20/96	10/20/96	10/20/96	10/20/96	10/21/96	10/21/96	10/21/96
Depth (feet):	0 to 1.2	0 to 1.5	0 to 1	0 to 1	1 to 2	0 to 1	0 to 1.5	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1.5	0 to 1	0 to 1.5	0 to 1.5	0 to 1	0 to 1
Analyte (mg/kg)																	
Cyanide, Total	1 U	1 U	1 U	1 U	1 U	2.6	1 U	7.9	1.4	1.8	1.3	1.4	1 U	4.4	3.6	1 U	1.3
Fluoride by 340.1/.2	45000	570	8100	420	10500	19000	12000	13000	34000	21000	7000	8100 (J)	18000 (J)	25000 (J)	57000 (J)	50000 (J)	27000 (J)
Fluoride By 300.0	100	20	48	9.3	25 (J)	64 (J)	44 (J)	3.5 (J)	41 (J)	170 (J)	160 (J)	50	58	160	120	55	55
Total Organic Carbon	58500	10500	20100	4430	69700	60700	57200	67100	185000	70000	56000	93400	133000	150000	163000	79800	89400
Total Metals																	
Aluminum	38200 J	25800 J	16100 J	19000 J	26000 J	37000 J	22400 J	34900 J	74200 J	46900 J	26800 J	35400 (J)	28200 (J)	41600 (J)	55400 (J)	27900 (J)	37200 (J)
Antimony	10 UJ	2.5 UJ	2.5 UJ	2.5 UJ	3.6 J	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 UJ	2.5 UJ	2.5 UJ	2.5 UJ	10 UJ	2.5 UJ
Arsenic	13.8	10.1	5.03	2.6	10.4	15.5	9.83	13.3	10.1	10.2	7.02	9.67	9.75	15.3	16.5	12.9	11.8
Barium	257	152	110	140	156	211	211	154	122	144	87.1	155	228	194	267	250	219
Beryllium	2.6	0.78	0.9	0.52	1.19	1.81	1.47	1.58	2.47	1.97	0.85	2.06	1.45	2.14	3.39	2.5	2.2
Cadmium	3.7	1.17	1.54	0.5 U	6.81	1.92	4.43	1.2	0.76	2.68	0.5 U	3.31	2.97	3.84	8.44	5.96	7.63
Calcium	70500 (J)	6440 (J)	16200 (J)	5600 (J)	29000 (J)	28300 (J)	43200 (J)	18400 (J)	22600 (J)	24100 (J)	10100 (J)	26200	34500	31900	63000	67400	43000
Chromium	34.2	30.2	20.8	25.8	38.9	110	42.9	107	123	67.6	60.3	41.5 (J)	60.1 (J)	93.1 (J)	57.2 (J)	26.2 (J)	31.7 (J)
Cobalt	10.7	12	6.82	9.76	11.4	32.2	9.71	27.7	28.1	14.9	18	16.2	20.6	30.2	18.2	8.3	9.76
Copper	92.5	46.3	43.3	27.8	162	288	97.3	220	280	170	131	191	173	266	245	100	154
Iron	26500	32300	21300	25900	20600	24300	22300	21800	9500	18400	14000	19800	22000	22700	23000	23800	22800
Lead	61.5	37.8	23.8	10.2	83.5	46.8	45.9	36.1	26.6	71.5	25.6	52.4	54.5	58.6	114	87.9	76.6
Magnesium	5920	6120	3200	5550	3820	4530	3770	3720	1700	3140	2600	3060	4590	4200	3540	3430	3200
Manganese	879	473	607	239	303	676	745	559	155	428	233	559	468	533	877	2220	1760
Mercury	1.07	0.2 U	0.28	0.2 U	0.37	0.49	0.5	0.43	0.23	0.3	0.27	0.46	0.49	0.499	0.871	0.866	0.44
Nickel	106	25.8	42.5	27.8	118	733	149	703	790	307	453	389 (J)	414 (J)	669 (J)	345 (J)	79.2 (J)	133 (J)
Potassium	3350	2200	958	1470	1550	1970	2010	1540	715	1170	966	1070	1980	1630	1940	1880	1440
Selenium	6.7	1 U	1.4	1 U	6.11	1.9	3.1	1.4	1.3	1.5	1 U	1.8	2	1.9	4	4.4	2.9
Silver	1.5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.1	1.5 U	1 U
Sodium	6800	939	1640	694	2050	2270	2480	1780	2030	2740	1260	1560	1540	1910	3880	3470	2830
Thallium	1 U	1 U	1 U	1 U	1.3	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Vanadium	94.3	71.9	62.2	73.3	103	243	98	271	242	122	173	125	141	195	113	69.6	74.7
Zinc	175	173	94.1	62	383	148	179	115	88.3	138	73.9	161	192	174	271	1010	258
PAHs																	
2-Methylnaphthalene	4.3 U	0.49 U	22 U	0.48 U	26 U	1.9 U	100 U	1.4 U	0.6 U	37 U	0.49 U(J)	47 U	11 U	9.7 U	24 U	33 U	26 U
Acenaphthene	4.3 U	0.49 U	22 U	0.48 U	26 U	1.9 U	100 U	0.17 J	0.6 U	37 U	0.49 U(J)	47 U	11 U	0.98 J	24 U	33 U	26 U
Acenaphthylene	4.3 U	0.49 U	22 U	0.48 U	26 U	1.9 U	100 U	1.4 U	0.6 U	37 U	0.49 U(J)	47 U	11 U	9.7 U	24 U	33 U	26 U
Anthracene	9.9	0.49 U	6.3 J	0.48 U	3.3 J	1.1 J	14 J	0.86 J	0.2 J	6.3 J	0.064 J(J)	8.8 J	1.6 J	18	22 J	10 J	26 J
Benzo(a)anthracene	160 D	0.12 J	85	0.071 J	33	9.6	140	7.4	1.5	76	0.56 (J)	100	22	190 D	170	100	220 D
Benzo(a)pyrene	160 D	0.13 J	98	0.1 J	70	11	180	5.6	0.087 J	20 J	0.055 J(J)	18 J	3.3 J	150 D	25	12 J	23 J
Benzo(b)fluoranthene	270 D	0.39 J	160	0.17 J	170	20 D	370	11	1.3	130	0.38 J(J)	140	28	240 D	160	92	220 D
Benzo(g,h,i)perylene	34	0.16 J	33	0.27 J	38	4	120	1.3 J	0.6 U	37 U	0.49 U(J)	47 U	11 U(J)	43	24 U	33 U	26 U
Benzo(k)fluoranthene	130 D	0.26 J	72	0.13 J	60	7.1	150	4.8	0.62	85	0.25 J(J)	60	18	35	93	48	150
Chrysene	290 D	0.29 J	190 D	0.17 J	140	24 D	460	15 D	2.1	170	0.78 (J)	200	43	300 D	240 D	130	290 D
Dibenzo(a,h)anthracene	4.3 U	0.49 U	22 U	0.48 U	18 J	1.9 U	100 U	0.69 J	0.062 J	12 J	0.49 U(J)	13 J	4.1 J(J)	18	22 J	12 J	19 J
Fluoranthene	110 D	0.12 J	42	0.068 J	7 J	6.5	31 J	8.7	2.8	47	1 (J)	77	7.7 J	180 D	24 U	97	26 U
Fluorene	0.49 J	0.49 U	22 U	0.48 U	26 U	1.9 U	100 U	0.31 J	0.24 J	37 U	0.17 J(J)	47 U	11 U	1.6 J	4.6 J	33 U	11 J
Indeno(1,2,3-cd)pyrene	69 D	0.14 J	37	0.23 J	42	4.1	93 J	1.4 J	0.6 U	11 J	0.49 U(J)	9.7 J	2.5 J(J)	39	13 J	7.8 J	3.2 J
Naphthalene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Phenanthrene	8.4	0.49 U	5.4 J	0.48 U	3 J	1.2 J	100 U	1.3 J	0.3 J	4.7 J	0.12 J(J)	5.2 J	1.2 J	11	30	6.6 J	39
Pyrene	100 D	0.11 J	27	0.056 J	6.9 J	4.5	26 J	5.6	0.48 J	20 J	0.21 J(J)	24 J	2.3 J	160 D	53	22 J	59
PCBs																	
Aroclor 1016	0.85 U(J)	0.049 U	0.55 U	0.048 U	1.3 U	0.97 U	2.1 U(J)	0.072 U(J)	0.3 U	0.75 U	0.049 U(J)	0.94 U(J)	1 U(J)	0.97 U	1.2 U	1.6 U(J)	1.3 U(J)
Aroclor 1221	1.7 U(J)	0.099 U	1.1 U	0.097 U	2.7 U	2 U	4.2 U(J)	0.15 U(J)	0.61 U	1.5 U	0.1 U(J)	1.9 U(J)	2 U(J)	2 U	2.5 U	3.4 U(J)	2.7 U(J)
Aroclor 1232	0.85 U(J)	0.049 U	0.55 U	0.048 U	1.3 U	0.97 U	2.1 U(J)	0.072 U(J)	0.3 U	0.75 U	0.049 U(J)	0.94 U(J)	1 U(J)	0.97 U	1.2 U	1.6 U(J)	1.3 U(J)
Aroclor 1242	0.85 U(J)	0.049 U	0.55 U	0.048 U	1.3 U	0.97 U	2.1 U(J)	0.072 U(J)	0.3 U	0.75 U	0.049 U(J)	0.94 U(J)	1 U(J)	0.97 U	1.2 U	1.6 U(J)	1.3 U(J)
Aroclor 1248	0.85 U(J)	0.049 U	0.55 U	0.048 U	1.3 U	0.97 U	2.1 U(J)	0.42 (J)	2.1 P	1.8 P	0.45 (J)	0.94 U(J)	1 U(J)	0.97 U	1.2 U	1.6 U(J)	1.3 U(J)
Aroclor 1254	0.85 U(J)	0.049 U	0.55 U	0.048 U	1.3 U	0.97 U	2.1 U(J)	0.072 U(J)	0.3 U	0.75 U	0.049 U(J)	0.94 U(J)	1 U(J)	0.97 U	1.2 U	1.6 U(J)	1.3 U(J)
Aroclor 1260	0.85 U(J)	0.049 U	0.55 U	0.048 U	1.3 U	0.97 U	2.1 U(J)	0.072 U(J)	0.3 U	0.75 U	0.049 U(J)	0.94 U(J)	1 U(J)	0.97 U	1.2 U	1.6 U(J)	1.3 U(J)
Aroclor 1262	0.85 U(J)	0.049 U	0.55 U	0.048 U	1.3 U	0.97 U	2.1 U(J)	0.072 U(J)	0.3 U	0.75 U	0.049 U(J)	0.94 U(J)	1 U(J)	0.97 U	1.2 U	1.6 U(J)	1.3 U(J)
Aroclor 1268	0.85 U(J)	0.049 U	0.55 U	0.048 U	1.3 U	0.96 J	2.1 U(J)	0.59 (J)	0.96 P	0.75 U	0.049 U(J)	0.94 U(J)	1 U(J)	0.97 U	1.2 U	1.6 U(J)	1.3 U(J)
TPH																	
TPH (HCID)		U		U	U	U	U	U	U	U	U		U		U		
Diesel by 8015	490		570									280		1200		2200	1400

Table D-1
Surface Soil and Sediment Sample Analytical Results for 1996

Sample ID:	CL-SD001-0000-0	CL-SD002-0000-0	CL-SD003-0000-0	CL-SD004-0000-0	CL-SD005-0000-0	CL-SD009-0000-0	CL-SD011-0000-0	CL-SD013-0000-0	CL-SD018-0000-0	CL-SD019-0000-0	CL-SD020-0000-0	CL-SD022-0000-0	CL-SD024-0000-0	CL-SD028-0000-0	CL-SD032-0000-0	CL-SD034-0000-0	CL-SD037-0000-0
Station ID:	CL-SD001	CL-SD002	CL-SD003	CL-SD004	CL-SD005	CL-SD009	CL-SD011	CL-SD013	CL-SD018	CL-SD019	CL-SD020	CL-SD022	CL-SD024	CL-SD028	CL-SD032	CL-SD034	CL-SD037
Date Sampled:	10/15/96	10/15/96	10/15/96	10/16/96	10/19/96	10/19/96	10/19/96	10/20/96	10/20/96	10/20/96	10/20/96	10/20/96	10/20/96	10/20/96	10/21/96	10/21/96	10/21/96
Depth (feet)	0 to 1.2	0 to 1.5	0 to 1	0 to 1	1 to 2	0 to 1	0 to 1.5	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1.5	0 to 1	0 to 1.5	0 to 1.5	0 to 1	0 to 1
Analyte (mg/kg)																	
VOCs																	
1,1,1,2-Tetrachloroethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
1,1,1-Trichloroethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
1,1,2,2-Tetrachloroethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
1,1,2-Trichloroethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
1,1-Dichloroethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
1,1-Dichloroethene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
1,1-Dichloropropene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
1,2,3-Trichlorobenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
1,2,3-Trichloropropane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
1,2,4-Trichlorobenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
1,2,4-Trimethylbenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
1,2-Dibromo-3-	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U(R)	0.01 U	0.01 U(R)	0.01 U(R)	0.01 U(R)	0.01 U(R)	0.01 U(R)	0.01 U(R)	0.01 U(R)	0.01 U(R)	0.01 U(R)	0.02 U(R)	0.01 U(R)
1,2-Dibromoethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
1,2-Dichlorobenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
1,2-Dichloroethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
1,2-Dichloropropane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
1,3,5-Trimethylbenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
1,3-Dichlorobenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
1,3-Dichloropropane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
1,4-Dichlorobenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
2,2-Dichloropropane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
2-Chlorotoluene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
4-Chlorotoluene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Benzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Bromobenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Bromochloromethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Bromodichloromethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Bromoform	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Bromomethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Carbon Tetrachloride	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Chlorobenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Chloroethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Chloroform	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Chloromethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Cis-1,2-Dichloroethene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Cis-1,3-Dichloropropene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Dibromochloromethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Dibromomethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Dichlorodifluoromethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Ethylbenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Hexachlorobutadiene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Isopropylbenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.011 (U)	0.024 (U)	0.028 (U)	0.044 (U)	0.01 (U)	0.035 (UJ)	0.039 (UJ)	0.047 U(J)	0.11 U(J)	0.21 (UJ)	0.069 U(J)	0.15 U(J)	0.081 U(J)
Methylene Chloride	0.01 U	0.023 U	0.023 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
N-Butylbenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
N-Propylbenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
P-Isopropyltoluene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Sec-Butylbenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Styrene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Tert-Butylbenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Tetrachloroethene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Toluene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Trans-1,2-Dichloroethene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Trans-1,3-Dichloropropene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Trichloroethene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Trichlorofluoromethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Vinyl Chloride	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U
Xylenes, Total	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U

Abbreviations and Symbols:
D = compound run at a dilution to bring the concentration of that compound within the linear range of the instrument
J = estimated value
P = greater than 25% difference for detected concentrations between the two columns used for analysis
R = result rejected owing to gross QA/AC outliers; presence or absence of material cannot be certain
U = undetected
( ) = advisory flag based on professional judgment rather than method protocol

Table D-2
Native Sediment Analytical Results for 1996

Sample ID:	CL-SD005-0010-0	CL-SD009-0020-0	CL-SD011-0020-0	CL-SD013-0025-0	CL-SD016-0010-0	CL-SD018-0020-0	CL-SD019-0030-0	CL-SD020-0025-0	CL-SD022-0030-0	CL-SD024-0015-0	CL-SD028-0030-0	CL-SD032-0030-0	CL-SD034-0020-0	CL-SD037-0035-0
Station ID:	CL-SD005	CL-SD009	CL-SD011	CL-SD013	CL-SD016	CL-SD018	CL-SD019	CL-SD020	CL-SD022	CL-SD024	CL-SD028	CL-SD032	CL-SD034	CL-SD037
Date Sampled:	10/19/96	10/19/96	10/19/96	10/20/96	10/20/96	10/20/96	10/20/96	10/20/96	10/20/96	10/20/96	10/20/96	10/21/96	10/21/96	10/21/96
Depth (feet)	1 to 2	2 to 3	2 to 4	2.5 to 3.5	1 to 2	2 to 3	3 to 4	2.5 to 3.5	3 to 4	1.5 to 2.5	3 to 4	3 to 3.8	2 to 3	3.5 to 4.5
Analyte (mg/kg)														
Cyanide, Total	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Fluoride by 340.1/2	470	410	300	670	410	400	450	470	430 (J)	630 (J)	390 (J)	400 (J)	3300 (J)	480 (J)
Fluoride By 300.0	30 (J)	29 (J)	14 (J)	76 (J)	41 (J)	50 (J)	49 (J)	89 (J)	22	35	23	28	15	70
Total Organic Carbon	4310	8980	3930	15500	11000	8850	8590	7530	8250	14200	8310	16400	2050	12900
Total Metals														
Aluminum	24000 J	16400 J	8200 J	19200 J	12600 J	10700 J	15100 J	9720 J	8190 (J)	15000 (J)	9580 (J)	9190 (J)	15900 (J)	12000 (J)
Antimony	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Arsenic	3.1	3.1	2.6	10.1	7.54	2.2	2.5	3.4	2.4	3.2	2.6	2.2	5.54	4.3
Barium	148	112	40.4	146	73.1	60.9	119	94.5	51.7	120	63.4	90.5	171	107
Beryllium	0.5 U	0.5 U	0.5 U	0.6	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.62	0.5 U
Cadmium	0.5 U	0.5 U	0.5 U	0.63	0.76	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Calcium	7030 (J)	6270 (J)	4150 (J)	6600 (J)	4200 (J)	4950 (J)	5780 (J)	4470 (J)	4030	5860	4250	3890	5490	4640
Chromium	28	21.4	13.7	23.9	16.2	13.1	20.8	15.7	12.2 (J)	19.2 (J)	19.5 (J)	13.8 (J)	24.5 (J)	17.4 (J)
Cobalt	7.51	8.28	5.58	13.3	6.71	5.69	8.22	7.07	5.94	8.56	6.49	7.95	11.6	8.05
Copper	34.3	25.9	14.8	43.3	23.6	19.2	19.1	21.2	20.8	31	21.9	21.2	25.8	25.7
Iron	21800	21100	13600	25900	18300	13200	20200	16300	12900	19200	13900	15400	29800	19100
Lead	9.9	11	5 U	36.9	26.7	5 U	6.5	8.5	5 U	13.2	6.2	5.6	9.8	15
Magnesium	5590	4520	1650	5920	3040	2550	4450	3300	2200	4490	2690	3520	5240	4080
Manganese	192	170	144	242	219	169	170	145	103	185	123	201	415	221
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	38.4	16.2	31.9	20	12.1	10.9	16.5	14	9.93 (J)	21.4 (J)	12.2 (J)	12.7 (J)	20.2 (J)	14.8 (J)
Potassium	1700	1510	476	2050	1050	749	1310	899	527	1460	718	816	1390	1220
Selenium	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Silver	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Sodium	967	929	838	958	921	953	895	504	778	910	789	753	483	725
Thallium	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Vanadium	64.4	57	53.1	62.2	50.8	43.6	54.9	45.4	43.9	51.5	45.2	43.8	62.1	48.8
Zinc	72.9	55.8	28.9	138	114	35.5	48.1	53.3	29.4	64.1	37.5	38.7	65.7	71.8
PAHs														
2-Methylnaphthalene	0.51 U	0.49 U	0.43 U	0.56 U	0.52 U	0.5 U	0.45 U	0.49 U	0.48 U(J)	0.54 U(J)	0.49 U	0.51 U(J)	0.48 U	0.52 U(J)
Acenaphthene	0.51 U	0.49 U	0.43 U	0.56 U	0.52 U	0.5 U	0.45 U	0.49 U	0.48 U(J)	0.54 U(J)	0.49 U	0.51 U(J)	0.092 J	0.52 U(J)
Acenaphthylene	0.51 U	0.49 U	0.43 U	0.56 U	0.52 U	0.5 U	0.45 U	0.49 U	0.48 U(J)	0.54 U(J)	0.49 U	0.51 U(J)	0.48 U	0.52 U(J)
Anthracene	0.51 U	0.49 U	0.43 U	0.56 U	0.52 U	0.5 U	0.45 U	0.49 U	0.48 U(J)	0.54 U(J)	0.49 U	0.51 U(J)	0.48 U	0.52 U(J)
Benzo(a)anthracene	0.071 J	0.49 U	0.06 J	0.56 U	0.52 U	0.2 J	0.45 U	0.49 U	0.48 U(J)	0.11 J(J)	0.49 U	0.51 U(J)	0.48 U	0.52 U(J)
Benzo(a)pyrene	0.11 J	0.49 U	0.056 J	0.2 J	0.52 U	0.5 U	0.45 U	0.49 U	0.48 U(J)	0.054 U(J)	0.49 U	0.51 U(J)	0.48 U	0.52 U(J)
Benzo(b)fluoranthene	0.26 J	0.061 J	0.12 J	0.56 U	0.52 U	0.14 J	0.45 U	0.49 U	0.48 U(J)	0.54 U(J)	0.49 U	0.51 U(J)	0.48 U	0.52 U(J)
Benzo(g,h,i)perylene	0.071 J	0.49 U	0.068 J	0.56 U	0.52 U	0.5 U	0.45 U	0.49 U	0.48 U(J)	0.54 U(J)	0.49 U	0.51 U(J)	0.48 U	0.52 U(J)
Benzo(k)fluoranthene	0.14 J	0.49 U	0.078 J	0.56 U	0.52 U	0.092 J	0.45 U	0.49 U	0.48 U(J)	0.15 J(J)	0.061 J	0.51 U(J)	0.069 J	0.52 U(J)
Chrysene	0.25 J	0.082 J	0.18 J	0.56 U	0.52 U	0.29 J	0.45 U	0.49 U	0.48 U(J)	0.54 U(J)	0.49 U	0.51 U(J)	0.48 U	0.52 U(J)
Dibenz(a,h)anthracene	0.51 U	0.49 U	0.43 U	0.56 U	0.52 U	0.5 U	0.45 U	0.49 U	0.48 U(J)	0.16 J(J)	0.49 U	0.51 U(J)	0.056 J	0.52 U(J)
Fluoranthene	0.51 U	0.49 U	0.082 J	0.56 U	0.52 U	0.44 J	0.45 U	0.49 U	0.48 U(J)	0.54 U(J)	0.49 U	0.51 U(J)	0.48 U	0.52 U(J)
Fluorene	0.51 U	0.49 U	0.43 U	0.56 U	0.52 U	0.5 U	0.45 U	0.49 U	0.48 U(J)	0.54 U(J)	0.49 U	0.51 U(J)	0.48 U	0.52 U(J)
Indeno(1,2,3-cd)pyrene	0.082 J	0.49 U	0.43 U	0.56 U	0.52 U	0.5 U	0.45 U	0.49 U	0.48 U(J)	0.54 U(J)	0.49 U	0.51 U(J)	0.48 U	0.52 U(J)
Naphthalene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenanthrene	0.51 U	0.49 U	0.43 U	0.56 U	0.52 U	0.5 U	0.45 U	0.49 U	0.48 U(J)	0.54 U(J)	0.49 U	0.51 U(J)	0.48 U	0.52 U(J)
Pyrene	0.51 U	0.49 U	0.07 J	0.56 U	0.52 U	0.068 J	0.45 U	0.49 U	0.48 U(J)	0.54 U(J)	0.49 U	0.51 U(J)	0.061 J	0.52 U(J)
PCBs														
Aroclor 1016	0.051 U	0.049 U(J)	0.043 U	0.056 U(J)	0.052 U	0.05 U	0.045 U	0.047 U	0.048 U(J)	0.054 U(J)	0.049 U	0.051 U	0.048 U	0.052 U(J)
Aroclor 1221	0.1 U	0.099 U(J)	0.088 U	0.11 U(J)	0.1 U	0.1 U	0.091 U	0.096 U	0.097 U(J)	0.11 U(J)	0.099 U	0.1 U	0.097 U	0.1 U(J)
Aroclor 1232	0.051 U	0.049 U(J)	0.043 U	0.056 U(J)	0.052 U	0.05 U	0.045 U	0.047 U	0.048 U(J)	0.054 U(J)	0.049 U	0.051 U	0.048 U	0.052 U(J)
Aroclor 1242	0.051 U	0.049 U(J)	0.043 U	0.056 U(J)	0.052 U	0.05 U	0.045 U	0.047 U	0.048 U(J)	0.054 U(J)	0.049 U	0.051 U	0.048 U	0.052 U(J)
Aroclor 1248	0.051 U	0.049 U(J)	0.043 U	0.056 U(J)	0.052 U	0.05 U	0.045 U	0.047 U	0.048 U(J)	0.054 U(J)	0.049 U	0.051 U	0.048 U	0.052 U(J)
Aroclor 1254	0.051 U	0.049 U(J)	0.043 U	0.056 U(J)	0.052 U	0.05 U	0.045 U	0.047 U	0.048 U(J)	0.054 U(J)	0.049 U	0.051 U	0.048 U	0.052 U(J)
Aroclor 1260	0.051 U	0.049 U(J)	0.043 U	0.056 U(J)	0.052 U	0.05 U	0.045 U	0.047 U	0.048 U(J)	0.054 U(J)	0.049 U	0.051 U	0.048 U	0.052 U(J)
Aroclor 1262	0.051 U	0.049 U(J)	0.043 U	0.056 U(J)	0.052 U	0.05 U	0.045 U	0.047 U	0.048 U(J)	0.054 U(J)	0.049 U	0.051 U	0.048 U	0.052 U(J)
Aroclor 1268	0.051 U	0.049 U(J)	0.043 U	0.056 U(J)	0.052 U	0.05 U	0.045 U	0.047 U	0.048 U(J)	0.054 U(J)	0.049 U	0.051 U	0.048 U	0.052 U(J)
TPH														
TPH (HCID)	U	U	U	U	U	U	U	U	U	U	U	U	U	U

Table D-2
Native Sediment Analytical Results for 1996

Sample ID:	CL-SD005-0010-0	CL-SD009-0020-0	CL-SD011-0020-0	CL-SD013-0025-0	CL-SD016-0010-0	CL-SD018-0020-0	CL-SD019-0030-0	CL-SD020-0025-0	CL-SD022-0030-0	CL-SD024-0015-0	CL-SD028-0030-0	CL-SD032-0030-0	CL-SD034-0020-0	CL-SD037-0035-0
Station ID:	CL-SD005	CL-SD009	CL-SD011	CL-SD013	CL-SD016	CL-SD018	CL-SD019	CL-SD020	CL-SD022	CL-SD024	CL-SD028	CL-SD032	CL-SD034	CL-SD037
Date Sampled:	10/19/96	10/19/96	10/19/96	10/20/96	10/20/96	10/20/96	10/20/96	10/20/96	10/20/96	10/20/96	10/20/96	10/21/96	10/21/96	10/21/96
Depth (feet)	1 to 2	2 to 3	2 to 4	2.5 to 3.5	1 to 2	2 to 3	3 to 4	2.5 to 3.5	3 to 4	1.5 to 2.5	3 to 4	3 to 3.8	2 to 3	3.5 to 4.5
Analyte (mg/kg)														
VOCs														
1,1,1,2-Tetrachloroethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1,1,1-Trichloroethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1,1,2,2-Tetrachloroethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1,1,2-Trichloroethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1,1-Dichloroethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1,1-Dichloroethene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1,1-Dichloropropene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1,2,3-Trichlorobenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1,2,3-Trichloropropane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1,2,4-Trichlorobenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U(R)	0.01 U(R)	0.01 U(R)	0.01 U(R)
1,2,4-Trimethylbenzene	0.01 U	0.01 U	0.01 U	0.01 U(R)	0.01 U(R)	0.01 U(R)	0.01 U(R)	0.01 U(R)	0.01 U(R)	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1,2-Dibromo-3-chloropropane	0.01 U(R)	0.01 U(R)	0.01 U(R)	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1,2-Dibromoethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1,2-Dichlorobenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1,2-Dichloroethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1,2-Dichloropropane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1,3,5-Trimethylbenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1,3-Dichlorobenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1,3-Dichloropropane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1,4-Dichlorobenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
2,2-Dichloropropane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
2-Chlorotoluene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
4-Chlorotoluene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Bromobenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Bromochloromethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Bromodichloromethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Bromoform	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Bromomethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Carbon Tetrachloride	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Chlorobenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Chloroethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Chloroform	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Chloromethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Cis-1,2-Dichloroethene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Cis-1,3-Dichloropropene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Dibromochloromethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Dibromomethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Dichlorodifluoromethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Ethylbenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Hexachlorobutadiene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Isopropylbenzene	0.01 U	0.01 U	0.01 U	0.03 (U)	0.01 (U)	0.087 (U)	0.036 (U)	0.051 (U)	0.044 U(J)	0.031 U(J)	0.052 U(J)	0.051 U(J)	0.053 U(J)	0.043 U(J)
Methylene Chloride	0.067 (U)	0.011 (U)	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
N-Butylbenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
N-Propylbenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
P-Isopropyltoluene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Sec-Butylbenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Styrene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Tert-Butylbenzene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Tetrachloroethene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Toluene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Trans-1,2-Dichloroethene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Trans-1,3-Dichloropropene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Trichloroethene	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Trichlorofluoromethane	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Vinyl Chloride	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Xylenes, Total	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U

Abbreviations and Symbols:

J = estimated value

R = result rejected owing to gross QA/AC outliers; presence or absence of material cannot be certain

U = undetected

( ) = advisory flag based on professional judgment rather than method protocol

Table D-3
West Company Lake Analytical Results for Soil

Sample ID:	CL-SD038-0120-0	CL-SD038-0150-0	CL-SD039-0075-0	CL-SD039-0120-0	CL-SD040-0235-0
Station ID:	CL-SD038	CL-SD038	CL-SD039	CL-SD039	CL-SD040
Date Sampled:	11/26/96	11/26/96	11/26/96	11/26/96	11/27/96
Depth (ft):	12-13	15-16	7.5-9	12-13	23.5-25
Description:	Potential Process Residue	Native Soil	Potential Process Residue	Native Soil	Potential Process Residue
Analyte (mg/kg)					
Cyanide, Total	7.7	1 U	1 U	1 U	1 U
Fluoride By 340.1/.2	8200 (J)	270 (J)	370 (J)	190 (J)	370 (J)
Fluoride By 300.0	360 D	5	21	9	2.5 U
Total Organic Carbon	41300	6070	12100	577	1500
Total Metals					
Aluminum	21500 J	6820 J	12000 J	5890 J	4810 J
Antimony	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Arsenic	4.7	1.4	3.8	1.2	0.58
Barium	116	28.6	85.4	26.6	33.4
Beryllium	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Cadmium	0.5	0.5 U	0.5 U	0.5 U	0.5 U
Calcium	11100	3340	4380	3100	2510
Chromium	49.8	10.3	16	12	8.32
Cobalt	12.6	4.19	7.49	4.24	3.56
Copper	66.3	11.9	22.9	11.7	9.13
Iron	18700 J	10600 J	16700 J	11100 J	8370 J
Lead	21.4	5 U	14.2	5 U	5 U
Magnesium	3760	1440	3060	1310	1390
Manganese	194	97	232	91.1	73.6
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	173	7.78	39	11.8	6.69
Potassium	1390	278	986	222	271
Selenium	1 U	1 U	1 U	1 U	1 U
Silver	1 U	1 U	1 U	1 U	1 U
Sodium	1630	719	685	613	454
Thallium	1 U	1 U	1 U	1 U	1 U
Vanadium	114	38.7	50.8	45	29.5
Zinc	90.3	24.4	76.7	22.5	24.5
PAHs					
2-Methylnaphthalene	0.52 U	0.52 U	0.43 U	0.43 U	0.43 U
Acenaphthene	0.52 U	0.52 U	0.43 U	0.43 U	0.43 U
Acenaphthylene	0.52 U	0.52 U	0.43 U	0.43 U	0.43 U
Anthracene	0.52 U	0.52 U	0.43 U	0.43 U	0.43 U
Benzo(a)anthracene	0.78	0.52 U	0.43 U	0.43 U	0.43 U
Benzo(a)pyrene	0.43 J	0.52 U	0.43 U	0.43 U	0.43 U
Benzo(b)fluoranthene	0.6	0.52 U	0.43 U	0.43 U	0.43 U
Benzo(g,h,i)perylene	0.32 J	0.52 U	0.43 U	0.43 U	0.43 U
Benzo(k)fluoranthene	0.41 J	0.52 U	0.43 U	0.43 U	0.43 U
Chrysene	2.1	0.52 U	0.43 U	0.43 U	0.43 U
Dibenzo(a,h)anthracene	0.52 U	0.52 U	0.43 U	0.43 U	0.43 U
Fluoranthene	1.8	0.52 U	0.43 U	0.43 U	0.43 U
Fluorene	0.52 U	0.52 U	0.43 U	0.43 U	0.43 U
Indeno(1,2,3-cd)pyrene	0.52 U	0.52 U	0.43 U	0.43 U	0.43 U
Naphthalene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Phenanthrene	0.21 J	0.52 U	0.43 U	0.43 U	0.43 U
Pyrene	0.94	0.52 U	0.43 U	0.43 U	0.43 U
TPAH	7.59	U	U	U	U
PCBs					
Aroclor 1016	0.052 U	0.052 U	0.043 U	0.043 U	0.043 U
Aroclor 1221	0.1 U	0.1 U	0.088 U	0.088 U	0.088 U
Aroclor 1232	0.052 U	0.052 U	0.043 U	0.043 U	0.043 U
Aroclor 1242	0.052 U	0.052 U	0.043 U	0.043 U	0.043 U
Aroclor 1248	0.052 U	0.052 U	0.043 U	0.043 U	0.043 U
Aroclor 1254	0.052 U	0.052 U	0.043 U	0.043 U	0.043 U
Aroclor 1260	0.052 U	0.052 U	0.043 U	0.043 U	0.043 U
Aroclor 1262	0.052 U	0.052 U	0.043 U	0.043 U	0.043 U
Aroclor 1268	0.34 P	0.052 U	0.043 U	0.043 U	0.043 U

Table D-3
West Company Lake Analytical Results for Soil

Sample ID:	CL-SD038-0120-0	CL-SD038-0150-0	CL-SD039-0075-0	CL-SD039-0120-0	CL-SD040-0235-0
Station ID:	CL-SD038	CL-SD038	CL-SD039	CL-SD039	CL-SD040
Date Sampled:	11/26/96	11/26/96	11/26/96	11/26/96	11/27/96
Depth (ft):	12-13	15-16	7.5-9	12-13	23.5-25
Description:	Potential Process Residue	Native Soil	Potential Process Residue	Native Soil	Potential Process Residue
Analyte (mg/kg)					
TPH					
TPH (HCID)	U	U	U	U	U
VOCs					
1,1,1,2-Tetrachloroethane	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
1,1,1-Trichloroethane	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
1,1,2,2-Tetrachloroethane	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
1,1,2-Trichloroethane	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
1,1-Dichloroethane	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
1,1-Dichloroethene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
1,1-Dichloropropene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
1,2,3-Trichlorobenzene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
1,2,3-Trichloropropane	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
1,2,4-Trichlorobenzene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
1,2,4-Trimethylbenzene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
1,2-Dibromo-3-Chloropropane	0.02 U(R)	0.02 U(R)	0.02 U(R)	0.02 U(R)	0.02 U(R)
1,2-Dibromoethane	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
1,2-Dichlorobenzene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
1,2-Dichloroethane	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
1,2-Dichloropropane	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
1,3,5-Trimethylbenzene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
1,3-Dichlorobenzene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
1,3-Dichloropropane	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
1,4-Dichlorobenzene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
2,2-Dichloropropane	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
2-Chlorotoluene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
4-Chlorotoluene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Benzene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Bromobenzene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Bromochloromethane	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Bromodichloromethane	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Bromoform	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Bromomethane	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Carbon Tetrachloride	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Chlorobenzene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Chloroethane	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Chloroform	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Chloromethane	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Cis-1,2-Dichlorotethene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Cis-1,3-Dichloropropene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Dibromochloromethane	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Dibromomethane	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Dichlorodifluoromethane	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Ethylbenzene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Hexachlorobutadiene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Isopropylbenzene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Methylene Chloride	0.027 U	0.022 U	0.03 U	0.028 U	0.027 U
N-Butylbenzene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
N-Propylbenzene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
P-Isopropyltoluene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Sec-Butylbenzene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Styrene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Tert-Butylbenzene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Tetrachloroethene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Toluene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Trans-1,2-Dichlorotethene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Trans-1,3-Dichloropropene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Trichloroethene	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U

Table D-3
West Company Lake Analytical Results for Soil

Sample ID:	CL-SD038-0120-0	CL-SD038-0150-0	CL-SD039-0075-0	CL-SD039-0120-0	CL-SD040-0235-0
Station ID:	CL-SD038	CL-SD038	CL-SD039	CL-SD039	CL-SD040
Date Sampled:	11/26/96	11/26/96	11/26/96	11/26/96	11/27/96
Depth (ft):	12-13	15-16	7.5-9	12-13	23.5-25
Description:	Potential Process Residue	Native Soil	Potential Process Residue	Native Soil	Potential Process Residue
Analyte (mg/kg)					
VOCs (cont'd)					
Trichlorofluoromethane	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Vinyl Chloride	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Xylenes, Total	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U

Abbreviatoins and Symbols:
D = compound run at a dilution to bring the concentration of that compound within the linear range of the instrument
J = estimated value
P = greater than 25% difference for detected concentrations between the two methods used for analysis
R = result rejected owing to gross QA/QC outliers; presence or absence of material cannot be certain
U = undetected
( ) = advisory flag based on professional judgment rather than method protocol